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COMPUTER PROGRAM FOR PROJECT FORMULATION

STRUCTURE SITE ANALYSIS

COMPUTER PROGRAM FOR PROJECT FORMULATION
STRUCTURE SITE ANALYSIS VERSION 2

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COMPUTER PROGRAM FOR PROJECT FORMULATION
STRUCTURE SITE ANALYSIS VERSION 2

Abstract

DAMS2 is a revision of a Fortran IV computer program (DAMS, issued November 1967) that facilitates the hydraulic and hydrologic analyses of floodwater retarding structure sites. The program uses the sites' storage-discharge capacities to floodroute inflow hydrographs through a potential reservoir. Storage and discharge capacity may be computed by the program or loaded as input data. Inflow hydrographs may be actual or developed from any storm rainfall distribution. The program will compute embankment quantities if desired. The input data for a job is printed out as it is loaded and edited for such things as invalid characters in the data fields, missing data required for a run, and unreasonably large or small data values where possible. A liberal amount of user options and program control are provided for greater application flexibility.

Program Description

The computer program DAMS2 is organized by the executive control concept. It will accept input data in any logical sequence. A series of control words, used in the input data, direct the program to execute its various procedures in the order in which they appear in the input data. There are no limits on the number of alternates that may be considered for each site nor on the number of sites for each job. Also, as many jobs as desired from any number of sources may be batched in a single computer run with each job being independent of the previous job's data. The input data may request design or/and simulation runs. The design runs are based on SCS design criteria; however, the user has the ability to alter certain controlling parameters such as weir and orifice flow coefficients, method of computing direct runoff, number of increments on the hydrographs, precision of some solutions, drawdown time requirements, etc. The full extent of user options is given in the detailed input data description that follows. Standard or default conditions are maintained until changed by the user. They are automatically restored for each job.

Reservoir storage, if not given by input data, is calculated by the program from the sites' elevation-surface area relationship. This relation is defined by two to twenty points connected by straight-line

segments. The points do not have to be at regular intervals. If a solution exceeds the range of the data, the first or last pair of points on the structure rating table are linearly extrapolated as far as required and a warning message printed. The input elevation-surface area data should account for the encroachment upon reservoir storage by the embankment of the structure. The amount of encroachment may be approximate since the height of dam is usually not known when the input data is prepared.

Discharge capacity of a structure consists of principal and emergency spillway flows, and the two are combined by the program to develop the total rating of the structure. The program does not consider downstream flow conditions in the analysis except for tailwater on the principal spillway outlet, which is supplied by the user and is considered constant. The principal spillway capacity may be calculated by the program for round or rectangular closed-conduits of uniform cross section with open-top drop, covered drop or hooded inlets. The drop inlets may be single or two-stage. If these conditions will not adequately represent the stage-discharge characteristics of the principal spillway, the desired stage-discharge relation may be given in the input data.

Emergency spillway discharges may be given in the input data, recovered from a file of pre-computed stage-discharge relationships for standard emergency spillway approach channels, or developed by water surface profiles (Chapter 14, 1/71, NEH-4). The pre-computed data and the water surface profiles assume a control section at the downstream end of the flat section. Cases 1 through 17 of SCS ES-124 have been pre-computed for a variety of spillway lengths and a Manning's "n" of 0.04. The centerline profiles of all seventeen cases of ES-124 are defined by the program and the user may define up to 10 additional profiles. Water surface profiles calculated by the program are based on a flat-bottom channel with frictionless sides and uniform roughness coefficient. The stage-discharge relations of the emergency spillway is based on a trapezoidal section. If desired, the program will determine the emergency spillway bottom width corresponding to a user specified velocity in the exit channel during passage of the emergency spillway hydrograph.

The minimum crest elevation of the emergency spillway according to design criteria will be determined by the program if desired. As many as five emergency spillway bottom widths and up to five emergency crest elevations may be considered in each pass for a structure site. By updating the spillway data (as part of a single set of input data) an unlimited number of alternates may be considered in a single computer run.

Principal spillway and emergency spillway design hydrographs are based on criteria in SCS Engineering Memorandum-27 (Rev. 3/19/65) and Chapter 21 (Rev. 1/71) of the SCS National Engineering Handbook, Section 4, Hydrology (NEH-4). Rainfall amounts for developing principal and emergency spillway hydrographs may be given in the input data or calculated

from two index storms (the 100-year, point, six-hour and the six-hour point PMP). A third option permits the input of runoff directly for either the principal spillway or the emergency spillway design hydrographs or for both.

All inflow hydrographs are developed from unit hydrograph theory, Chapter 16, NEH-4 (Rev. 1/71), but may differ slightly from corresponding dimensionless hydrographs in NEH-4. Differences are due to the grouping process required to produce tables such as those in NEH-4.

Volume of fill, area to seed, area of dam, maximum height and length of dam may be calculated simultaneously with the analysis. Embankment top width, side slopes, wave action berm width and stability berm width may be specified by the user. If not specified, the program assumes top width = $(\text{Height} + 35)/5$, upstream and downstream side slopes to be 2.5:1, wave action berm width = 10 feet, and stability berms not used. The top width of the embankment may be constant or vary as the maximum height.

Printed output from the program is fairly well self-explanatory and options may be controlled by the user. Output options are included to permit the user to control the volume of output so that it is compatible with the number of alternates being considered. For alternate design with a large number of alternates, output should generally be held to the minimum. For final studies, detailed listings of the rating tables and a digital plot of the inflow and outflow hydrographs should be requested. Punched outputs of the rating tables and inflow and outflow hydrographs are also available in forms compatible with the other SCS project formulation programs.

Program Limitations

Only one structure site at a time may be held in core storage, but by updating the structure data an unlimited number of sites may be studied in one computer run. A maximum of 20 points may be used to describe the sites' elevation-surface area or elevation-surface area-discharge-storage volume relation. A maximum of 99 points may be used to define the sites' centerline profile.

Up to five user defined rainfall distribution tables of up to 300 coordinates each may be held in core storage at one time. Any one of these plus the standard SCS 6-hour design distribution, defined by the program, may be used for design or simulation runs.

A maximum of 300 points may be specified to define inflow hydrographs developed by the program. This limitation also applies to hydrographs supplied by the user for routing through the structure. Only one user supplied hydrograph may be held in storage at any one time. Following the control word to route that hydrograph, another may be inserted by the update procedure. In addition, one user supplied dimensionless unit hydrograph, of up to 100 coordinates may be held in storage at the same time.

An emergency spillway rating relation may be defined by the user with a maximum of 12 points (discharges) at uniform stage increments above the emergency spillway crest.

Up to 10 user supplied centerline profiles for the emergency spillway inlet channel may be described with a maximum of 7 coordinates each. The first coordinate (0,0), located at the control section, is set by the program. The six additional points are supplied by the user.

In developing the emergency spillway rating, the program assumes that the exit channel slope is steep enough for a control section to exist at the downstream end of the inlet channel. There is no provision in the program to accurately compute spillway flow characteristics when it is subcritical in the exit channel.

DESCRIPTION OF INPUT DATA

THE ORDER IN WHICH THE DATA IS LOADED IS NOT RIGID. IT IS ONLY NECESSARY THAT THE REQUIRED DATA BE ENTERED AHEAD OF THE 'GO' CARD WHICH INITIATES THE COMPUTATIONS IN THE PROGRAM.

CONTROL CARDS DIRECT THE OPERATION OF THE PROGRAM. THEIR SPELLING MUST BE AS SHOWN IN THE FOLLOWING PARAGRAPHS, HOWEVER, IMBEDDED BLANKS TO IMPROVE READABILITY ARE OPTIONAL. THE FORMAT OF ALL CONTROL CARDS IS...

COL 1-10	THE CONTROL WORD.
COL 11-70, BY	DATA FIELDS. DECIMAL POINTS ARE OPTIONAL
10-COL FIELDS	IN THE DATA FIELDS, EXCEPT FOR DECIMAL FRACTIONS. A DECIMAL POINT IS ASSUMED BY THE PROGRAM TO FOLLOW THE LAST SIGNIFICANT DIGIT IF ONE IS NOT PRESENT.
COL 71-80	CARD IDENTIFICATION.

MOST OF THE CONTROL CARDS CONTAIN ALL DATA NECESSARY FOR THE PARTICULAR OPERATION. THE EXCEPTIONS ARE THOSE FOR LOADING TABULAR DATA.

THE DESCRIPTIONS OF THE PROGRAM CONTROL WORDS AND THEIR RELATED DATA ARE GIVEN IN ALPHABETIC ORDER. MANY OF THE OPERATIONS ARE USED ONLY FOR SPECIAL CASES. STANDARD VALUES ARE ASSIGNED BY THE PROGRAM BUT MAY BE ALTERED AS INDICATED IN THE FOLLOWING DESCRIPTIONS. SEE FIGURES 1 THROUGH 6 FOR A PICTORIAL DESCRIPTION OF THE INPUT DATA FORMATS.

CONTROL WORD	DESCRIPTION OF FUNCTION
DAMS2	INDICATES THE BEGINNING OF A JOB. ALL VARIABLES, COEFFICIENTS, ETC. ARE RESET TO PROGRAM-ASSUMED VALUES AND AN 80-80 LIST OF THE INPUT DATA TO THE NEXT 'ENDJOB' CARD IS PROVIDED.
COL 11-20	DATE ON WHICH THE INPUT DATA IS PREPARED IN MM/DD/YY FORMAT.
COL 21-70	TITLE OR DESCRIPTION OF THE JOB.
AREA CRCT	LOADS THE AREAL CORRECTION FACTORS FOR DRAINAGE AREAS GREATER THAN 100 SQUARE MILES AND FOR SPECIAL CASES.
COL 11-20	THE AREAL CORRECTION ZONE.. 1 MEANS ARID AND SEMIARID CLIMATE. 2 MEANS HUMID AND SUBHUMID CLIMATE. 3 MEANS PACIFIC COASTAL CLIMATE. 4 MEANS A SPECIAL CASE CLIMATE ZONE.
COL 21-30	AREAL CORRECTION FOR THE PRINCIPAL SPILLWAY HYDROGRAPH (PSH) 24-HOUR STORM RAINFALL.

COL 31-40 AREAL CORRECTION FOR THE PSH 10-DAY STORM RAINFALL.
COL 41-50 AREAL CORRECTION FOR THE EMERGENCY SPILLWAY (ESH) AND FREEBOARD (FBH) HYDROGRAPHS RAINFALL.

NOTE.. IF THE DRAINAGE AREA FOR A SITE IS GREATER THAN 100 SQ-MI AND NO CORRECTION FACTORS ARE LOADED, THE PORGRAM WILL USE THE 100 SQ-MI VALUES FOR ZONES 1, 2, AND 3 FROM FIGURE 21.2(A), NEH-4 (1/71).

BTM WIDTH LOADS EMERGENCY SPILLWAY CONTROL SECTION BOTTOM WIDTHS AND EXIT CHANNEL VELOCITIES TO BE CONSIDERED FOR A RUN.

COL 11-20 INDICATES THE TYPE OF DATA IN COLUMNS 21-70.
OPTIONS:
1) FEET - FOR OPTION (1) BELOW
2) VELOCITY - FOR OPTION (2) BELOW
COL 21-70, BY 10-COL FIELDS OPTIONS:
1) THE BOTTOM WIDTH IN FEET OF THE EMERGENCY SPILLWAY CHANNEL AT THE CONTROL SECTION.
2) THE MAXIMUM VELOCITY IN FEET PER SECOND IN THE ES EXIT CHANNEL. THE PROGRAM WILL DETERMINE THE BOTTOM WIDTH. (SEE 'BW DATA')

NOTE.. THE ABOVE OPTIONS MAY BE MIXED BY FOLLOWING WITH A SECOND 'BTM WIDTH' CARD WITH THE APPROPRIATE WORD IN COL 11-20. A MAXIMUM OF 5 WIDTHS AND VELOCITIES MAY BE SPECIFIED FOR EACH PASS.

BW DATA SETS PRECISION CONTROLS FOR DETERMINING EMERGENCY SPILLWAY CONTROL SECTION BOTTOM WIDTH WHEN THE MAXIMUM EXIT CHANNEL VELOCITY IS INPUT ON THE 'BTM WIDTH' CARD.

COL 21-30 THE MINIMUM ACCEPTABLE CONTROL SECTION BOTTOM WIDTH IN FEET, PROGRAM ASSUMES 20 FT.
COL 31-40 THE ESTIMATED BOTTOM WIDTH IN FEET. PROGRAM ASSUMES 64 FEET. THIS VALUE SHOULD BE ADJUSTED IF THE FINAL BOTTOM WIDTH IS NOT IN THE RANGE OF 50-100 FEET.
COL 41-50 PRECISION OF BOTTOM WIDTH IN FEET. PROGRAM ASSUMES ONE FOOT.
COL 51-60 RATIO OF THE ALLOWABLE DIFFERENCE BETWEEN ACTUAL VELOCITY AND SPECIFIED VELOCITY TO THE SPECIFIED VELOCITY, (VAC-VSP)/VSP. PROGRAM ASSUMES 0.03.

CLASS ENTERS VALUES OF K1 AND K2 FOR USE IN THE GENERALIZED DESIGN RAINFALL EQUATION..

$$PD = A*(K1*P100+K2*(PMP-P100))$$

WHERE..

PD IS THE DESIGN RAINFALL IN INCHES.

A IS AN ADJUSTMENT FACTOR INCORPORATING AREAL CORRECTIONS AND STORM DURATION EXTENSION IF THE TIME OF CONCENTRATION EXCEEDS SIX HOURS.

P100 IS THE 100 YEAR SIX-HOUR POINT RAINFALL IN INCHES. (SEE 'P100,PMP')

PMP IS THE SIX-HOUR POINT PROBABLE MAXIMUM PRECIPITATION IN INCHES.

K1 AND K2 ARE AS BELOW..

COL 11-20	K1 FOR SCS-PRINCIPAL SPILLWAY HYDROGRAPH.
COL 21-30	K1 FOR SCS-EMERGENCY SPILLWAY HYDROGRAPH.
COL 31-40	K1 FOR SCS-FREEBOARD HYDROGRAPH.
COL 41-50	K2 FOR SCS-PRINCIPAL SPILLWAY HYDROGRAPH.
COL 51-60	K2 FOR SCS-EMERGENCY SPILLWAY HYDROGRAPH.
COL 61-70	K2 FOR SCS-FREEBOARD HYDROGRAPH.

CL PROFILE ENTERS THE COORDINATES OF THE PROFILE ALONG THE CENTERLINE OF THE DAM.

COL 21-30	AN ADJUSTMENT FACTOR TO BE ADDED TO THE ELEVATION OF THE CENTERLINE PROFILE.
COL 31-70	THE TITLE OR DESCRIPTION OF THE PROFILE.

DATA CARDS 1-33	USE ONLY THOSE NEEDED.
COL 11-70, BY 10-COL FIELDS	COORDINATES OF THE CENTERLINE PROFILE IN THE ORDER.. DISTANCE FOR POINT 1, ELEVATION FOR POINT 1, DISTANCE FOR POINT 2, ELEVATION FOR POINT 2, ETC., IN ALGEBRAICALLY INCREASING ORDER WITH RESPECT TO DISTANCE.

NOTE.. THE 'CL PROFILE' OPERATION MUST BE TERMINATED BY USING AN 'END TABLE' CARD.

COMMENT CAUSES A COMMENT TO BE PRINTED ON THE PRINTOUT.

COL 11-70	TEXT OF THE COMMENT TO BE PRINTED.
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NOTE.. THE TEXT IS PRINTED AT THE TOP OF A NEW PAGE. ANY IMMEDIATELY FOLLOWING COMMENT CARDS ARE CONSIDERED CONTINUATIONS AND PRINTED ON THE SAME PAGE.

* ALTERNATE FOR 'COMMENT'

DDTESTS ENTERS VARIABLES TO CONTROL DRAWDOWN COMPUTATIONS FOR THE PRINCIPAL SPILLWAY.

COL 11-20	TIME LIMIT IN DAYS. PROGRAM ASSUMES 10.
COL 21-30	RATIO OF DETENTION STORAGE REMAINING TO TOTAL DETENTION STORAGE. PROGRAM ASSUMES 0.20.
COL 31-40	RATIO OF DETENTION POOL STAGE TO STAGE FOR FULL CONDUIT FLOW OF SINGLE STAGE INLETS. PROGRAM ASSUMES 0.00.

COL 41-50	RATIO OF DETENTION POOL STAGE TO HEIGHT OF ORIFICE FOR TWO-STAGE INLETS. PROGRAM ASSUMES 0.00.
COL 51-60	RATIO OF STRUCTURE DISCHARGE TO BASEFLOW. PROGRAM ASSUMES 0.00.
COL 61-70	RATIO OF STRUCTURE DISCHARGE TO PEAK OUTFLOW. PROGRAM ASSUMES 0.00.

NOTE.. DRAWDOWN COMPUTATIONS BEGIN WITH THE WATER SURFACE OF THE RESERVOIR AT THE MAXIMUM ELEVATION DURING PASSAGE OF THE PSH, AND CONTINUE TO THE ELEVATION CORRESPONDING TO THE MAXIMUM ELEVATION FROM THE APPLICATION OF THE ABOVE FIVE RATIOS.

DIMHYD ENTERS THE COORDINATES OF A DIMENSIONLESS UNIT HYDROGRAPH. THE DIMENSIONLESS UNIT HYDROGRAPH OF CHAPTER 16, NEH-4 IS DEFINED BY THE PROGRAM. 'DIMHYD' WILL REPLACE THAT HYDROGRAPH, BUT IT WILL BE RESTORED IF A 'DAMS2' CARD IS USED.

COL 21-30	THE VALUE OF X IN THE PEAK RATE EQUATION $QP = X \cdot A \cdot Q / TP$. SEE CHAPTER 16, NEH4(1/71).
COL 31-70	THE TITLE AND DESCRIPTION OF THE HYDROGRAPH.

DATA CARDS 1-20	USE ONLY THOSE NEEDED.
COL 21-70, BY 10 COL FIELDS	THE DIMENSIONLESS DISCHARGES. THE PEAK SHOULD HAVE A VALUE OF 1.000.

NOTE.. THE 'DIMHYD' OPERATION MUST BE TERMINATED BY USING AN 'END TABLE' CARD.

END JOB	TERMINATES THE PROCESSING OF A JOB. A JOB SUMMARY IS PRINTED OUT.
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END TABLE	TERMINATES THE LOADING OF TABULAR DATA. THIS CONTROL CARD MUST FOLLOW THE LAST DATA CARD OF TABULAR DATA ('STRUCTURE', 'RAINTABLE', 'HYD', 'DIMHYD', AND 'CL PROFILE' TABLES).
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ES CREST	SETS THE EMERGENCY SPILLWAY CREST ELEVATIONS TO BE CONSIDERED WHEN ROUTING HYDROGRAPHS.
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COL 11-20	INDICATES THE UNITS OF THE DATA IN COL 21-70. OPTIONS: 1) ELEV - FOR ELEVATION IN FEET. 2) FEET - FOR STAGE IN FEET. 3) AC-FT - FOR VOLUME IN ACRE-FEET.
COL 21-30	LEAVE BLANK TO ROUTE THE PRINCIPAL SPILLWAY HYDROGRAPH TO GET THE MINIMUM CREST. OTHERWISE, SAME AS 1) OR 3) IMMEDIATELY BELOW.

COL 31-70, BY
10-COL FIELDS

ALTERNATE EMERGENCY SPILLWAY CREST DATA.
OPTIONS:

- 1) THE ELEVATION IN FEET OF THE CREST OF THE EMERGENCY SPILLWAY.
- 2) THE CREST OF THE EMERGENCY SPILLWAY EXPRESSED AS STAGE ABOVE THE CREST ESTABLISHED BY ROUTING THE PSH OR THE CREST SET IN COL 21-30.
- 3) THE VOLUME OF FLOODWATER DETENTION STORAGE IN ACRE-Feet BETWEEN THE CRESTS OF THE PRINCIPAL AND EMERGENCY SPILLWAYS.
- 4) LEAVE BLANK IF NOT APPLICABLE.

NOTE.. THE ABOVE OPTIONS MAY BE MIXED BY INSERTING ADDITIONAL 'ES CREST' CARDS WITH THE APPROPRIATE UNITS IN COL 11-20. A MAXIMUM OF 5 CRESTS MAY BE SPECIFIED FOR EACH PASS.

ES DATA DEFINES THE EMERGENCY SPILLWAY INLET AND EXIT CHANNELS
TO BE USED FOR A RUN.

COL 11-20	AN EMERGENCY SPILLWAY CHANNEL BOTTOM PROFILE REFERENCE NUMBER. (SEE SCS DRAWING ES-124)
COL 21-30	THE LENGTH IN FEET OF THE EMERGENCY SPILLWAY INLET CHANNEL.
COL 31-40	MANNING'S ROUGHNESS COEFFICIENT FOR THE INLET CHANNEL.

NOTE.. THE DATA IN COL 11-40 FORM AN IDENTIFICATION SYMBOL. IF 'ES RATING' IS NOT LOADED, THE PROGRAM SEARCHES THE EMERGENCY SPILLWAY FILE (SEE 'ES FILE') FOR A STAGE-DISCHARGE RECORD WITH THE SAME IDENTIFICATION. IF THE RECORD IS NOT RECOVERED THIS WAY, THE PROGRAM USES THE COORDINATES OF THE DESIGNATED EMERGENCY SPILLWAY CHANNEL BOTTOM PROFILE, IF IT IS DEFINED (SEE 'ES PROFILE'), TO CALCULATE WATER SURFACE PROFILES TO DEVELOP THE EMERGENCY SPILLWAY STAGE-DISCHARGE RELATIONSHIP FOR THE RUN.

COL 41-50	THE AVERAGE EMERGENCY SPILLWAY SIDE SLOPE RATIO AT THE CONTROL SECTION, HORIZONTAL DIVIDED BY VERTICAL.
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NOTE.. THE AVERAGE ES SIDE SLOPE RATIO OF MULTI-CHANNELED SITUATIONS IS THE SUM OF THE AVERAGE ES SIDE SLOPE RATIOS OF THE INDIVIDUAL CHANNELS.

COL 51-60	MANNING'S ROUGHNESS COEFFICIENT FOR THE EXIT CHANNEL. PROGRAM ASSUMES 0.040
COL 61-70	SLOPE OF THE EXIT CHANNEL IN PERCENT.

NOTE.. IF NO EXIT CHANNEL SLOPE IS LOADED, THE PROGRAM USES THE CRITICAL SLOPE FOR A FLOW OF 25 PERCENT OF THE MAXIMUM DISCHARGE DURING THE PASSAGE OF THE ESH. SOLUTIONS FOR EXIT CHANNEL VELOCITIES ARE BASED ON UNIFORM FLOW CONDITIONS. IF PRINTED VELOCITY IS FOLLOWED BY '*', THAT VELOCITY IS FOR SUB-CRITICAL CONDITIONS.

ES FILE LOADS EMERGENCY SPILLWAY STAGE-DISCHARGE RECORDS
 ONTO A WORK FILE FOR SUBSEQUENT REFERENCE BY
 'ES DATA'.

DATA CARDS 1-XXX NO LIMIT TO THE NUMBER PERMITTED
 COL 2-10 THE NUMERICAL IDENTIFICATION OF THE RECORD.

 COL 2-3 AN EMERGENCY SPILLWAY CHANNEL BOTTOM PROFILE
 REFERENCE NUMBER. (SEE SCS ES-124)

 COL 4-6 THE LENGTH IN FEET OF THE INLET CHANNEL
 (UNITS POSITION IN COL 6 - NO DECIMAL).

 COL 7-10 MANNING'S ROUGHNESS COEFFICIENT OF THE INLET
 CHANNEL WITH THE DECIMAL POINT IN COL 7.

NOTE.. THE VARIABLES IN COL 2-10 OF THIS RECORD AND THE FIRST THREE
 DATA FIELDS OF 'ES DATA' MUST BE IDENTICAL FOR RECOVERY.

 COL 11-20 THE INCREMENT IN FEET OF STAGE ABOVE THE
 CREST OF THE EMERGENCY SPILLWAY AT WHICH
 DISCHARGES ARE GIVEN.

 COL 21-30, BY THE DISCHARGE RATES OF THE EMERGENCY SPILLWAY
 5 COL FIELDS IN CFS/FT OF CONTROL SECTION BOTTOM WIDTH AT
 THE VARIOUS STAGES. COL 21-25 IS FOR A STAGE
 OF 1 * STAGE INCREMENT., COL 26-30 FOR 2 *
 STAGE INCREMENT., ETC.

DATA CAPD XXX + 1 INDICATES THE END OF THE EMERGENCY SPILLWAY
 DISCHARGE FILE.

 COL 2-10 LEAVE BLANK OR INSERT ANY NEGATIVE NUMBER.

ES PROFILE ENTERS THE COORDINATES OF EMERGENCY SPILLWAY CHANNEL
 BOTTOM PROFILES USED IN THE CALCULATION OF EMERGENCY
 SPILLWAY WATER SURFACE PROFILES. THE WATER SURFACE
 PROFILES ARE CALCULATED FOR A FLAT-BOTTOMED CHANNEL
 WITH VERTICAL, FRICTIONLESS SIDES.

 COL 11-20 A PROFILE IDENTIFICATION NUMBER FROM 41 TO
 50. A MAXIMUM OF 50 PROFILES MAY BE STORED
 AT ONE TIME. (NUMBERS 01 THROUGH 40 ARE
 RESERVED FOR PROGRAM DEFINITION. NUMBERS 01
 THROUGH 17 ONLY ARE CURRENTLY DEFINED WHICH
 ARE THE 17 CASES GIVEN IN SCS ES-124). THIS
 INFORMATION CORRESPONDS TO COL 11-20 OF THE
 'ES DATA' CARD.

 COL 21-60, BY COORDINATES OF THE CENTERLINE PROFILE IN THE
 10-COL FIELDS ORDER.. DISTANCE IN FEET FOR POINT 2, DEPTH
 IN FEET FOR POINT 2, DISTANCE FOR POINT 3,
 DEPTH FOR POINT 3.

DATA CARDS 1-2	USE ONLY IF NEEDED.
COL 1-10	REPEAT THE CONTROL WORD 'ES PROFILE'.
COL 21-60, BY	SAME AS ABOVE, EXCEPT DATA IS FOR POINTS 4
10-COL FIELDS	AND 5, AND POINTS 6 AND 7.

NOTE.. THE PROFILES ARE DESCRIBED BY A MAXIMUM OF SEVEN X AND Y COORDINATES. THE FIRST POINT IS AT THE CONTROL SECTION, HAS COORDINATES (0,0) AND IS SET BY THE PROGRAM. THE REMAINDER OF THE POINTS ARE DEFINED BY THE DISTANCE UPSTREAM FROM THE CONTROL SECTION (X) AND CORRESPONDING DEPTH (Y).

ES RATING LOADS AN EMERGENCY SPILLWAY RATING CURVE.

COL 11-20	ANY NUMERIC IDENTIFICATION INFORMATION FOR LABELING OUTPUT.
COL 21-30	THE INCREMENT IN FEET OF STAGE ABOVE THE CREST OF THE EMERGENCY SPILLWAY AT WHICH DISCHARGES ARE GIVEN.
COL 31-70	ANY ALPHAMERIC IDENTIFICATION INFORMATION.
DATA CARDS 1-2	
COL 1-10	REPEAT CONTROL WORD 'ES RATING'.
COL 11-70, BY	THE DISCHARGE RATES OF THE EMERGENCY SPILLWAY IN CUBIC FEET PER SECOND PER FOOT OF CONTROL SECTION BOTTOM WIDTH. COL 11-20 IS FOR A STAGE OF 1 * STAGE INCREMENT, COL 21-30 FOR 2 * STAGE INCREMENT, ETC. USE 1 OR 2 CARDS AS NEEDED.
10-COL FIELDS	

NOTE.. ACTUAL DISCHARGE RATE IN CFS MAY BE USED. IF ACTUAL DISCHARGES ARE USED, THE BOTTOM WIDTH MUST BE ONE IN THE 'BTM WIDTH' CARD, THE EMERGENCY SPILLWAY SIDE SLOPE RATIO MUST BE ZERO AND OUTPUT REGARDING CRITICAL VELOCITY, CRITICAL SLOPE, ETC. SHOULD BE IGNORED.

GO, DESIGN INITIATES A DESIGN RUN OF THE DATA IN CORE STORAGE. THE INPUT DATA ARE EDITED AND IF NO ERRORS ARE DETECTED, COMPUTATION IS BEGUN.

COL 11-20	USE CODE LETTER(S) TO INDICATE THE DESIRED OUTPUT OPTION(S).
	L - LIST RATING TABLES.
	P - DETAILED LIST OF HYDROGRAPH AND FLOODROUTING DATA, INCLUDING PLOTTED INFLOW AND OUTFLOW HYDROGRAPHS.
	R - PUNCH RATING TABLES.
	I - PUNCH INFLOW HYDROGRAPH COORDINATES.
	O - PUNCH OUTFLOW HYDROGRAPH COORDINATES.
	C - DETAILED LIST OF COEFFICIENTS, PARAMETERS, RAINFALL DISTRIBUTION, DIMENSIONLESS UNIT HYDROGRAPH, ETC.
	E - CALCULATE VOLUME OF FILL AND OTHER EMBANKMENT QUANTITIES.

COL 21-25	THE IDENTIFICATION NAME OF THE RAINFALL DISTRIBUTION TO BE USED FOR ESH AND FBH DEVELOPMENT. LEAVE BLANK TO USE THE SCS 6-HOUR STORM DISTRIBUTION. (SEE 'RAINTABLE')
COL 31-40	THE RAINFALL DURATION IN HOURS TO BE USED IN ESH AND FBH DEVELOPMENT. REQUIRED IF COL 21-30 OF 'RAINTABLE' IS BLANK OR ONE.
COL 61-70	THE WATER SURFACE ELEVATION IN FEET AT THE START OF RAINFALL WHEN THE PSH IS NOT ROUTED. IF BLANK, ESH AND FBH ROUTINGS WILL START AT THE PRINCIPAL SPILLWAY CREST.

GO,STORM A SPECIFIC HYDROGRAPH, TO BE DEVELOPED FROM A RAINFALL DISTRIBUTION AND THE DATA ENTERED BY 'STORM', IS TO BE FLOODROUTED.

COL 11-20	SAME AS FOR 'GO,DESIGN' EXCEPT NO EMBANKMENT QUANTITIES ARE COMPUTED, PLUS: S - IF THE PRINCIPAL SPILLWAY ONLY IS TO BE USED IN ROUTING THE STORM HYDROGRAPH.
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NOTE.. ALL EMERGENCY SPILLWAY CRESTS AND BOTTOM WIDTHS GIVEN BY 'ES CREST' AND 'BTM WIDTH' WILL BE ROUTED IF THE S OUTPUT OPTION IS NOT ACTIVATED. IF COL 21-30 OF 'ES CREST' IS BLANK AND A DESIGN RUN HAS BEEN MADE ON THE DATA, THE EMERGENCY SPILLWAY CREST ESTABLISHED BY PSH CPITERIA WILL AUTCMATICALLY BE CARRIED OVER TO THIS RUN.

COL 21-25	THE IDENTIFICATION NAME OF THE RAINFALL DISTRIBUTION TO BE USED. LEAVE BLANK TO USE THE SCS 6-HOUR DESIGN STORM DISTRIBUTION.
COL 31-40	THE STORM RAINFALL AMOUNT IN INCHES.
COL 61-70	THE WATER SURFACE ELEVATION IN FEET AT THE BEGINNING OF STORM RAINFALL. LEAVE BLANK IF THE ROUTING IS TO BEGIN AT THE PRINCIPAL SPILLWAY CREST.

GO,HYD A GIVEN HYDROGRAPH WHOSE COORDINATES WERE LOADED BY 'HYD' IS TO BE ROUTED.

COL 11-20	SAME AS FOR 'GO,STORM'.
COL 21-60	NOT USED.
COL 61-70	SAME AS FOR 'GO,STORM'.

GO,RAINS

PERFORMS THE SAME OPERATION AS 'GO,STORM' EXCEPT A SERIES OF STORM RAINFALL AMOUNTS ARE USED. THE REQUIRED DATA ARE THE SAME AS FOR 'GO,STORM' EXCEPT:

COL 31-40 THE MINIMUM STORM RAINFALL AMOUNT IN INCHES.
COL 41-50 THE MAXIMUM STORM RAINFALL AMOUNT IN INCHES.
COL 51-60 THE RAINFALL INCREMENT IN INCHES. ALL STORM RAINFALL AMOUNTS BETWEEN AND INCLUDING THE MINIMUM AND MAXIMUM WILL BE FLOODROUTED.

GO,REACH

ROUTES THE LAST HYDROGRAPH(S) DEVELOPED BY 'GO,DESIGN', 'GO,STORM', OR 'GO,HYD' THRU THE REACH DESCRIBED ON THIS CONTROL CARD. A SERIES OF 'GO,REACH' CARDS MAY BE USED TO ROUTE THRU SEVERAL REACHES. THE ROUTED HYDROGRAPH WILL BE ADDED TO THE INFLOW HYDROGRAPH(S) DEVELOPED FOR THE NEXT STRUCTURE.

COL 11-20 USE CODE LETTERS TO INDICATE DESIRED OPTIONS.
P - PRINT OUT THE ROUTED HYDROGRAPH.
S - INDICATES THE ROUTED HYDROGRAPH IS NOT TO BE ADDED TO THE INFLOW HYD FOR THE NEXT STRUCTURE.
COL 21-30 REACH LENGTH IN FEET.
COL 31-40 ROUTING COEFFICIENT FOR THIS REACH.

***** THE 'GO,REACH' OPTION IS NOT OPERATIONAL AS OF JANUARY 1971. USERS WILL BE ADVISED WHEN IT IS. *****

GO,EMB

INITIATES COMPUTATIONS OF EMBANKMENT QUANTITIES FOR A SERIES OF TOP OF DAM ELEVATIONS.

COL 11-20 FOR DRY DAMS, INSERT THE WORDS 'DRY DAM'.
COL 21-30 THE MINIMUM ELEVATION OF THE TOP OF DAM.
COL 31-40 THE MAXIMUM ELEVATION OF THE TOP OF DAM.
COL 41-50 THE ELEVATION INCREMENT USED BETWEEN THE MINIMUM AND MAXIMUM TOP OF DAM ELEVATIONS.
COL 51-60 THE ELEVATION OF THE WAVE ACTION BERM.
LEAVE BLANK IF WAVE ACTION BERM NOT USED.

NOTE.. IF ONLY ONE TOP ELEVATION IS TO BE CONSIDERED, IT MUST BE ENTERED IN COL 21-30. IN THIS CASE COL 31-40 AND 41-50 MAY BE LEFT BLANK.

GO,TDD

INITIATES A RUN TO GET ONLY THE TIME OF DRAWDOWN OF A FLOOD DETENTION POOL USING THE DATA LOADED PREVIOUSLY BY 'STRUCTURE', 'PS DATA', 'PS INLET', AND 'POOL DATA'.

COL 21-30 ELEVATION IN FEET AT START OF DRAWDOWN.
COL 31-40 ELEVATION TO END DRAWDOWN COMPUTATIONS.
COL 41-50 BASEFLOW IN CFS TO BE USED IN COMPUTATIONS.

HYD ENTERS THE COORDINATES OF A GIVEN HYDROGRAPH TO BE
ROUTED.

COL 31-70 THE TITLE AND DESCRIPTION OF THE HYDROGRAPH.

DATA CARD NO. 1
COL 21-30 THE TIME INCREMENT IN HOURS AT WHICH THE
HYDROGRAPH IS DEFINED.

DATA CARDS 2-61 USE ONLY THOSE NEEDED. A MAXIMUM OF 20 IS
RECOMMENDED FOR COMPATIBILITY WITH HYDRO2.
COL 21-70, BY THE DISCHARGE RATES IN CFS.
10 COL FIELDS

NOTE.. THE 'HYD' OPERATION MUST BE TERMINATED BY USING AN 'END TABLE'
CARD.

KIRPICH SETS THE PROGRAM TO USE KIRPICH'S RELATIONSHIP WHEN
CALCULATING THE TIME OF CONCENTRATION. SEE FIGURE 3,
CHAPTER 15, NEH-4 (1956).

NPOINTS SETS THE NUMBER OF POINTS ON ESH AND FBH. MAXIMUM
ALLOWABLE IS 300. PROGRAM ASSUMES 101.

COL 11-20 NUMBER OF POINTS.

PDIRECT ENTERS THE POINT DESIGN RAINFALL AMOUNTS.

COL 11-20 CLIMATIC INDEX. SEE CHAPTER 21, NEH-4(1/71).

COL 21-30 THE ONE-DAY POINT PSH RAINFALL IN INCHES.

COL 31-40 THE TEN-DAY POINT PSH RAINFALL IN INCHES.

COL 41-50 THE POINT ESH RAINFALL IN INCHES FOR THE
DURATION SPECIFIED BY 'RAINTABLE' OR 'GO,
DESIGN'. IF THE DURATION IS NOT SPECIFIED
AND THE TIME OF CONCENTRATION IS GREATER THAN
6 HOURS, THE PROGRAM WILL MAKE THE CORRECTION
USING FIGURE 21.2C, NEH-4(1/71).

COL 51-60 THE POINT FBH RAINFALL IN INCHES.

COL 61-70 THE 100-YEAR TEN-DAY POINT RAINFALL. USED TO
CHECK IF THE REDUCED 10-DAY CURVE NUMBER MAY
BE USED. (SEE NEH-4, PAGE 21.2)

NOTE.. THE DATA LOADED BY CONTROL WORDS 'PDIRECT', 'P100,PMP', OR
'QDIRECT' ARE RELEVANT ONLY FOR DESIGN RUNS.
RUNOFF MAY BE ENTERED FOR THE PSH AND RAINFALL FOR THE ESH AND FBH
OR THE REVERSE BY USING BOTH A 'PDIRECT' AND A 'QDIRECT' CARD WITH
THE APPLICABLE DATA ON EACH.

POOL DATA ENTERS THE RESERVOIR STORAGE POOL INFORMATION.

COL 11-20	INDICATES THE UNITS OF THE DATA IN COL 21-50. OPTIONS: 1) ELEV - FOR OPTION (1) BELOW 2) INCHES - FOR OPTION (2) BELOW 3) AC-FT- FOR OPTION (3) BELOW
COL 21-30	PERMANENT POOL. OPTIONS: 1) ELEVATION IN FEET. 2) VOLUME IN WATERSHED INCHES. 3) VOLUME IN ACRE-FEET. 4) LEAVE BLANK FOR DRY DAMS.
COL 31-40	CREST OF THE PRINCIPAL SPILLWAY. OPTIONS: 1) ELEVATION IN FEET. 2) VOLUME IN WATERSHED INCHES BELOW CREST. 3) VOLUME IN ACRE-FEET BELOW THE CREST.
COL 41-50	OPTIONS: 1) ELEVATION IN FEET TO WHICH SEDIMENT MAY ACCUMULATE DURING THE RESERVOIR DESIGN LIFE. 2) VOLUME IN WATERSHED INCHES BETWEEN THE PRINCIPAL AND EMERGENCY SPILLWAY CRESTS TO BE ALLOCATED TO SEDIMENT DEPOSITION. 3) SAME AS (2) EXCEPT VOLUME IS ACRE-FEET. 4) LEAVE BLANK IF NOT APPLICABLE.

NOTE.. THE ABOVE OPTIONS MAY NOT BE MIXED.

PS COEFFS ENTERS THE PRINCIPAL SPILLWAY INLET FLOW COEFFICIENTS.

COL 21-30	THE COEFFICIENT FOR CALCULATING WEIR FLOW OVER THE LOW STAGE ORIFICE OF THE PRINCIPAL SPILLWAY INLET. PROGRAM ASSUMES 3.1
COL 31-40	THE DISCHARGE COEFFICIENT FOR CALCULATING FULL ORIFICE FLOW. PROGRAM ASSUMES 0.6
COL 41-50	THE COEFFICIENT FOR COMPUTING WEIR FLOW OVER THE PRINCIPAL SPILLWAY DROP INLET. PROGRAM ASSUMES 3.1.
COL 51-60	THE SIZE OF THE FILLET FOR RECTANGULAR PRINCIPAL SPILLWAY CONDUITS. PROGRAM ASSUMES SIX INCHES.

PS DATA THE INFORMATION ON THIS CARD WILL BE USED ONLY WHEN THE PRINCIPAL SPILLWAY RATING IS CALCULATED BY THE PROGRAM. (SEE 'STRUCTURE')

COL 11-20	THE NUMBER OF PRINCIPAL SPILLWAY CLOSED CONDUITS. LEAVE BLANK FOR ORIFICE CONTROLLED PRINCIPAL SPILLWAY FLOW.
COL 21-30	THE LENGTH OF THE PRINCIPAL SPILLWAY IN FEET FOR EVALUATING FRICTION LOSSES.

COL 31-40	OPTIONAL.. 1) DIAMETER OF CIRCULAR PRINCIPAL SPILLWAY CONDUITS IN INCHES. 2) WIDTH OF RECTANGULAR CONDUITS IN FEET.
COL 41-50	OPTIONAL.. 1) LEAVE BLANK FOR CIRCULAR CONDUITS. 2) HEIGHT OF RECTANGULAR CONDUITS IN FEET.
COL 51-60	MANNING'S ROUGHNESS COEFFICIENT FOR EVALUA- TING CLOSED CONDUIT FRICTION LOSSES.
COL 61-70	THE ELEVATION IN FEET OF THE HYDRAULIC GRA- DIENT AT THE PRINCIPAL SPILLWAY OUTLET.

PS INLET ENTERS THE PRINCIPAL SPILLWAY INLET INFORMATION.

COL 11-20	UNITS OF THE DATA IN COL 41-50. OPTIONS: 1) LEAVE BLANK FOR SINGLE STAGE INLETS. 2) ELEV - FOR ELEVATION IN FEET. 3) INCHES - FOR VOLUME IN WATERSHED INCHES. 4) AC-FT - FOR VOLUME IN ACRE-FEET.
COL 21-30	A COEFFICIENT FOR EVALUATING TOTAL ENERGY LOSSES FROM THE RESERVOIR TO JUST THROUGH THE ENTRANCE OF THE PRINCIPAL SPILLWAY CONDUIT. THIS COEFFICIENT MULTIPLIED BY THE VELOCITY HEAD IN THE CONDUIT IS THE INLET LOSS.
COL 31-40	THE WEIR LENGTH OF THE DROP INLET OF THE PRINCIPAL SPILLWAY IN FEET.
COL 41-50	THE HIGH STAGE CREST OF TWO-STAGE INLETS. MAY BE ELEVATION OR FLOODWATER DETENTION VOLUME BETWEEN HIGH AND LOW STAGE CRESTS. (SEE COL 11-20)
COL 51-60	OPTIONS: 1) LEAVE BLANK IF NOT APPLICABLE. 2) THE HEIGHT IN FEET OF RECTANGULAR LOW STAGE ORIFICES OF TWO-STAGE INLETS.
COL 61-70	OPTIONS: 1) LEAVE BLANK IF NOT APPLICABLE. 2) THE TOTAL LENGTH IN FEET OF RECTANGULAR LOW-STAGE ORIFICES.

PS FULL SETS THE PROGRAM SO THE PRINCIPAL SPILLWAY CLOSED
CONDUIT MUST FLOW FULL WITH THE WATER SURFACE AT THE
EMERGENCY SPILLWAY CREST DURING DESIGN RUNS. ONCE
ACTIVATED, THIS CONTROL REMAINS IN EFFECT UNTIL THE
NEXT 'DAMS2' CARD IS REACHED.

NOTE.. IF THIS SWITCH IS ON AND THE CONDUIT FAILS TO FLOW FULL, THE
EMERGENCY SPILLWAY CREST WILL BE RAISED TO MAKE IT FLOW FULL.
'PS FULL' IS IGNORED IF 'PS RATING' IS ACTIVATED OR IF THE TOTAL
STRUCTURE RATING IS LOADED IN THE 'STRUCTURE' TABLE.

PS RATING SETS A SWITCH TO INDICATE THE DISCHARGES LOADED BY THE PREVIOUS 'STRUCTURE' TABLE ARE FOR PRINCIPAL SPILLWAY FLOWS ONLY. THE PROGRAM WILL MERGE THESE FLOWS WITH THE PROGRAM COMPUTED EMERGENCY SPILLWAY FLOWS.

P100,PMP LOADS THE DATA FOR THE PROGRAM TO CALCULATE THE DESIGN RAINFALL AMOUNTS. (SEE 'CLASS')

COL 11-20 CLIMATIC INDEX (SEE CHAPTER 21,NEH-4).
 COL 21-30 100-YEAR SIX-HOUR POINT RAINFALL IN INCHES.
 COL 31-40 SIX-HOUR POINT PROBABLE MAXIMUM PRECIPITATION
 IN INCHES.
 COL 41-50 RATIO OF 24-HOUR STORM RAINFALL AMOUNTS TO
 SIX-HOUR STORM RAINFALL AMOUNTS.
 COL 51-60 RATIO OF 10-DAY STORM RAINFALL AMOUNTS TO 24-
 HOUR AMOUNTS.

QDIRECT ENTERS THE DESIGN RUNOFF AMOUNTS INCLUDING ANY BASEFLOW AT THE SITE.

COL 21-30 THE ONE-DAY PSH RUNOFF IN INCHES.
 COL 31-40 THE TEN-DAY PSH RUNOFF IN INCHES.
 COL 41-50 THE ESH DESIGN RUNOFF IN INCHES FOR THE
 DURATION SPECIFIED BY 'RAINTABLE' OR 'GO,
 DESIGN'.
 COL 51-60 THE FBH DESIGN RUNOFF IN INCHES.

NOTE.. SEE THE NOTE FOLLOWING 'PDIRECT' ABOVE.

Q,IA+I SETS THE PROGRAM TO CALCULATE EXCESS RAINFALL AMOUNTS BY THE INITIAL ABSTRACTION-AVERAGE INFILTRATION METHOD.

COL 21-30 THE INITIAL ABSTRACTION IN INCHES.
 COL 31-40 THE AVERAGE INFILTRATION IN INCHES PER HOUR.
 INFILTRATION WILL BE AT THE LESSER OF THIS
 RATE OR THE RAINFALL INTENSITY, AFTER THE
 INITIAL ABSTRACTION IS EXCEEDED.

Q,SCS SETS THE PROGRAM TO CALCULATE EXCESS RAINFALL AMOUNTS ACCORDING TO CHAPTER 10, NEH-4. PROGRAM ASSUMES THIS SETTING AND $IA/S = 0.2$.

COL 21-30 THE RATIO IA/S USED IN THE SCS RAINFALL-
 RUNOFF EQUATION. MAXIMUM ALLOWED IS 1.0

RAINTABLE LOADS A RAINFALL DISTRIBUTION TABLE. UP TO FIVE TABLES MAY BE HELD IN STORAGE AT ONE TIME.

COL 11-15 RRAINTABLE IDENTIFICATION NAME. THIS ID NAME MUST BE THE SAME AS COL 21-25 ON THE 'GO,-' CARDS FOR RECOVERY.

COL 21-30	DURATION OF RAINFALL IN HOURS. IF BLANK OR ONE, UNIT DURATION IS ASSUMED AND ACTUAL DURATION IS SPECIFIED BY 'GO,DESIGN'.
COL 31-70	THE TITLE, DATE AND DESCRIPTION OF THE STORM.
DATA CARDS 1-60	USE ONLY THOSE NEEDED. A MAXIMUM OF 20 IS RECOMMENDED FOR COMPATIBILITY WITH HYDRO2.
COL 21-70, BY 10-COL FIELDS	ACCUMULATED RAINFALL AMOUNTS AT EQUAL TIME INCREMENTS (ANY SIZE). THE RAINFALL DOES NOT HAVE TO START AT ZERO AND MAY BE ACTUAL OR DIMENSIONLESS AMOUNTS. THE TABLE IS PUT INTO DIMENSIONLESS FORM BY THE PROGRAM. TIME PERIODS DURING WHICH NO RAINFALL ACCUMULATES MAY BE LEFT BLANK, BUT THE DATA CARDS MAY NOT BE OMITTED.

NOTE.. THE 'RAINTABLE' OPERATION MUST BE TERMINATED BY USING AN 'END TABLE' CARD.

NOTE.. THE SCS 6-HOUR DESIGN STORM DISTRIBUTION (SEE CHAPTER 21, NEH4 AND EM-27) IS DEFINED BY THE PROGRAM. ITS USE IS DIRECTED BY LEAVING THE STORM IDENTIFICATION NAME (COL 21-25) IN THE 'GO,DESIGN', 'GO,STORM', OR 'GO,RAINS' CARD BLANK.

STEPS TP SETS THE NUMBER OF INCREMENTS TO THE PEAK OF UNIT HYDROGRAPHS. CONTROLS THE SMOOTHNESS AND ACCURACY OF THE COMPOSITE HYDROGRAPH. PROGRAM ASSUMES FIVE, MAXIMUM ALLOWED IS TEN.

COL 11-20 THE NUMBER OF STEPS TO BE USED.

STORM ENTERS DATA USED TO DEVELOP AN INFLOW HYDROGRAPH FOR A SPECIFIC STORM.

COL 11-20	THE NUMBER OF POINTS ON THE INFLOW HYDROGRAPH IF DIFFERENT FROM THAT USED FOR DEVELOPMENT OF DESIGN HYDROGRAPHS.
COL 21-30	THE TIME INCREMENT IN HOURS OF THE INFLOW HYDROGRAPH. IF THIS VALUE IS BLANK, THE PROGRAM WILL CALCULATE A TIME INCREMENT SO THAT THE LAST POINT IS AT THE END OF THE HYDROGRAPH.
COL 31-40	THE STORM DURATION IN HOURS.
COL 41-50	THE RUNOFF CURVE NUMBER TO BE USED IF DIFFERENT FROM THAT GIVEN IN 'WS DATA'.
COL 51-60	THE TIME OF CONCENTRATION IN HOURS IF DIFFERENT FROM THAT DEFINED BY 'WS DATA'.
COL 61-70	THE BASEFLOW IN CSM TO BE ADDED TO DIRECT RUNOFF.

STRUCTURE INITIATES LOADING OF DATA DESCRIBING A RESERVOIR SITE. ELEVATIONS AND SURFACE AREAS ARE REQUIRED, BUT DISCHARGES AND STORAGE VOLUMES ARE OPTIONAL EXCEPT THE RESERVOIR VOLUME AT THE FIRST ELEVATION SHOULD BE GIVEN IF IT IS NOT ZERO. IF DISCHARGES AND VOLUMES ARE NOT GIVEN THE PROGRAM WILL COMPUTE THEM USING THE ELEVATION-AREA RELATION AND INPUT SPILLWAY DATA.

COL 11-15	STRUCTURE IDENTIFICATION FOR LABELING PUNCHED OUTPUT.
COL 21-70	THE TITLE, DESCRIPTION AND LOCATION OF THE STRUCTURE.
DATA CARDS 1-20	
COL 21-30	ELEVATIONS IN FEET CORRESPONDING TO RESERVOIR SURFACE AREA, DISCHARGE, OR VOLUME ON THE SAME CARD. ELEVATIONS MUST BE IN INCREASING ORDER, AND USE ONLY AS MANY AS REQUIRED TO ADEQUATELY DEFINE THE ELEVATION-SURFACE AREA RELATIONSHIP AS A SERIES OF STRAIGHT-LINE SEGMENTS. IF THE MAXIMUM ELEVATION IS NOT HIGH ENOUGH TO OBTAIN A SOLUTION, THE LAST TWO POINTS OF THE DEVELOPED OR GIVEN RATING TABLE WILL BE LINEARLY EXTRAPOLATED.
COL 31-40	RESERVOIR SURFACE AREAS IN ACRES CORRESPONDING TO THE ELEVATIONS GIVEN IN COL 21-30.
COL 41-50	DISCHARGE IN CFS RELATED TO THE ELEVATIONS IN COL 21-30.
COL 51-60	STORAGE VOLUME IN ACRE-FEET AT THE ELEVATIONS IN COL 21-30.

NOTE.. THE 'STRUCTURE' OPERATION MUST BE TERMINATED BY USING AN 'END TABLE' CARD.

TC-15.3 SETS THE PROGRAM TO USE FIGURE 15.3, NEH-4 (JAN.1971) WHEN CALCULATING THE TIME OF CONCENTRATION.

TEMPLATE PROVIDES THE VARIABLES WHICH DEFINE THE SHAPE OF THE CROSS SECTION OF THE FILL. THIS INFORMATION WILL BE USED IN THE CALCULATION OF EMBANKMENT QUANTITIES.

COL 11-20	THE TOP WIDTH OF THE DAM IF NOT CALCULATED BY.. $TW = (H+35)/5$. IF CALCULATED BY THE PROGRAM, THE TOP WIDTH IS AN EVEN NUMBER.
COL 21-30	THE SIDE SLOPE RATIO OF THE UPSTREAM FACES OF THE FILL IF NOT 2.5.
COL 31-40	THE SIDE SLOPE OF THE DOWNSTREAM FACES OF THE FILL IF NOT 2.5.
COL 41-50	THE WIDTH OF THE UPSTREAM WAVE ACTION BERM. LEAVE BLANK IF WAVE ACTION BERM IS NOT USED.
COL 51-60	THE WIDTH OF STABILITY BERMS IF USED.

COL 61-70

THE MAXIMUM VERTICAL INCREMENT IN HEIGHT OF DAM ON THE UPSTREAM FACE ABOVE THE PERMANENT POOL OR CREST OF PRINCIPAL SPILLWAY AND ON THE DOWNSTREAM FACE. LEAVE BLANK IF STABILITY BERMS ARE NOT USED.

NOTE.. THE VOLUME OF FILL AND EMBANKMENT QUANTITIES ARE BASED ON..

- A) A SIX-INCH PARABOLIC CROWN ACROSS THE TOP OF THE DAM.
- B) LEVEL GROUND SURFACE PERPENDICULAR TO THE CENTERLINE PROFILE.
- C) A SLOPE OF ONE FOOT ON WAVE ACTION BERMS.
- D) THE LOWEST ELEVATION OF THE WAVE ACTION BERM IS THE PERMANENT POOL OF CONVENTIONAL RESERVOIRS, THE CREST OF THE PRINCIPAL SPILLWAY OF DRY DAMS.
- E) VERTICAL PLANES PERPENDICULAR TO THE CENTERLINE ARE ASSUMED AT THE FIRST AND LAST POINTS ON THE CENTERLINE PROFILE IF THE TOP OF THE EMBANKMENT IS HIGHER.
- F) THE AREA OF THE DAM IS CALCULATED TO THE TOE OF SLOPE LINE. THE AREA TO SEED IS THE AREA OF THE DAM LESS ANY AREA BELOW THE PERMANENT POOL.

IF 'TEMPLATE' IS NOT LOADED, THE PROGRAM ASSUMES: TOP WIDTH TO BE CALCULATED, WAVE ACTION BERM WIDTH = 10 FEET, UPSTREAM AND DOWNSTREAM SIDE SLOPE RATIOS = 2.5, AND STABILITY BERMS NOT USED.

WS DATA ENTERS DESIGN CRITERIA AND DATA FOR THE WATERSHED AREA ABOVE THE STRUCTURE.

COL 11

A NUMBER DESIGNATING THE TYPE OF RAINFALL AREAL CORRECTIONS.

- 1 MEANS ARID AND SEMIARID CLIMATE.
- 2 MEANS HUMID AND SUBHUMID CLIMATE.
- 3 MEANS PACIFIC COASTAL CLIMATE.
- 4 MEANS A USER DEFINED CLIMATE AREA.

NOTE.. THE PROGRAM CALCULATES THE AREAL CORRECTIONS FOR DRAINAGE AREAS UP TO 100 SQUARE MILES. FOR DRAINAGE AREAS GREATER THAN 100 SQUARE MILES OR FOR SPECIAL CASES, SEE 'AREA CRCT'.

COL 12

THE HYDROLOGIC DESIGN CRITERIA CLASS (A,B,C) TO BE USED. USE 'S' FOR USER DEFINED DESIGN CLASS (SEE 'CLASS').

NOTE.. DESIGN CLASS 0 OR 0 IS RESERVED FOR CLASS A DAMS WHERE THE HEIGHT-STORAGE PRODUCT AS DEFINED IN EM-27 IS LESS THAN 3000. THE ONLY DIFFERENCE BETWEEN THIS CLASS AND ALL OTHERS IS THAT THE SLOPING LINE OF FIGURE F-I OF EM-27 CONTINUES RATHER THAN CHANGING TO A HORIZONTAL LINE AT 200 CFS.

COL 21-30	THE RUNOFF CURVE NUMBER (SEE CHAPTERS 7-10, NEH4) FOR ANTECEDENT MOISTURE CONDITION II.
COL 31-40	THE WATERSHED AREA OF THE STRUCTURE SITE IN SQUARE MILES.
COL 41-50	OPTIONAL.. 1) THE TIME OF CONCENTRATION OF THE WATERSHED IN HOURS. 2) THE WATERSHED LENGTH IN FEET FOR CALCULATING THE TIME OF CONCENTRATION.
COL 51-60	OPTIONAL.. 1) LEAVE BLANK IF TIME OF CONCENTRATION IS GIVEN. 2) THE WATERSHED ELEVATION DIFFERENCE IN FEET FOR CALCULATING THE TIME OF CONCENTRATION.

NOTE.. FOR 'TC-15.3', COL 51-60 SHOULD BE THE PRODUCT OF THE WATERSHED LENGTH TIMES THE WATERSHED SLOPE.

COL 61-70	THE QUICK RETURN FLOW IN CSM TO BE COMPARED WITH FLOW COMPUTED ACCORDING TO CHAPTER 21, NEH-4(REV.1/71) FOR PSH DEVELOPMENT. THE MAXIMUM WILL BE USED.
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NOTE.. FOR 'QDIRECT', COL 61-70 SHOULD BE THE FLOW FROM THE QUICK RETURN FLOW MAP, EXHIBIT 21.3, NEH-4(1/71), OR FROM STREAMGAGE ANALYSIS, WHICHEVER IS APPLICABLE.

WSP ACCUR	SETS THE VALUE OF TWO TEST VARIABLES TO CONTROL THE PRECISION OF EMERGENCY SPILLWAY WATER SURFACE PROFILE CALCULATIONS.
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COL 21-30	THE MAXIMUM ALLOWABLE DIFFERENCE IN FEET BETWEEN THE CALCULATED AND THE ESTIMATED WATER SURFACE ELEVATION AT ANY SECTION. THE PROGRAM ASSUMES 0.005 FEET.
COL 31-40	THE MAXIMUM ALLOWABLE CHANGE IN AVERAGE VELOCITIES BETWEEN ADJACENT UPSTREAM AND DOWNSTREAM SECTIONS, EXPRESSED AS A PROPORTION OF THE AVERAGE VELOCITY BETWEEN THE SECTIONS. THE PROGRAM ASSUMES 0.05.

DAMS2 INPUT DATA FORMATS

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E S D A T A										Spillway Type Number										Spillway Length										Control Section "n"										Side Slope										Exit Channel "n"										Exit Channel Slope																			
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Figure 1 (Sheet 1 of 4)

DAMS2 INPUT DATA FORMATS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80																																																																															
Control Word										Data Fields																																																		Card Ident.																			
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ES PROFILE										Profile Number										Distance pt. 2										Depth pt. 2										Distance pt. 3										Depth pt. 3																													
ES PROFILE																				Distance pt. 4										Depth pt. 4										Distance pt. 5										Depth pt. 5																													
ES PROFILE																				Distance pt. 6										Depth pt. 6										Distance pt. 7										Depth pt. 7																													
										Spillway Type Number										Stage Increment										Any Alphanumeric Label																																																	
ES RATING										q1										q2										q3										q4										q5										q6																			
ES RATING										q7										q8										q9										q10										q11										q12																			
GO, DESIGN										Output Options 1/										Rain Table ID										ESH & FBH Storm Duration																				Start. Elev. if not at PS Crest																													
GO, STORM										Output Options										Rain Table ID										Storm Rainfall																				Start. Elev. if not at PS Crest																													
GO, HYD										Output Options																																								Start. Elev. if not at PS Crest																													
GO, RAINS										Output Options										Rain Table ID										Minimum Storm Rainfall										Maximum Storm Rainfall										Rainfall Increment										Start. Elev. if not at PS Crest																			
GO, REACH										P - print Hyd S - No add										Reach Length										Routing Coefficient "c"																																																	
GO, EMB																				Minimum Top Elevation										Maximum Top Elevation										increment										Elevation Wave Berm																													

Figure 1 (Sheet 2 of 4)

DAMS2 INPUT DATA FORMATS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Control Word										Data Fields																																																												Card Ident.									
										1										2										3										4										5										6																			
G O , T D D																				Start Elev.										End Elev.										Baseflow-cfs																																							
K I R P I C H																																																																															
N P O I N T S										No. of points																																																																					
P D I R E C T										Climatic Index										P 1 DA - in.										P 10 DA - in.										P ESH - in.										P FBH - in.										P 100 yr. 10 day-in.																			
P O O L D A T A										Units										Permanent Pool										Crest Principal Spillway										Flood Pool Sediment																																							
P S C O E F F S																				"C" Weir First Stage										"C" Orifice First Stage										"C" Weir High Stage										Fillet-inches																													
P S D A T A										Number of Conduits										Length - ft.										Diameter or Width										____ or Height										Manning's "n"										Hydraulic Gradient at Outlet																			
P S I N L E T										High Stage Crest Units										Entrance Loss - K _i										Weir Length - ft.										Crest of High Stage										Orifice Height-ft.										Orifice Length - ft.																			
P S F U L L																																																																															
P S R A T I N G																																																																															
P I O O , P M P										Climatic Index										P 100										PMP										Ratio P ₂₄ /P ₆										Ratio P _{10DA} /P ₂₄																													
Q D I R E C T																				Q 1 DA - in.										Q 10 DA - in.										Q ESH - in.										Q FBH - in.																													

Figure 1
(Sheet 3 of 4)

DAMS2 INPUT DATA FORMATS

Figure 1
(Sheet 4 of 4)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80										
Control Word										Data Fields																																																		Card Ident.																													
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Q, I A + I																				IA - Inches										Infiltration in/hr																																																											
Q, S C S																				IA/S																																																																					
S T E P S T P										No. of Steps																																																																															
S T O R M										No. of Points on Inflow Hyd.										Inflow Hyd. Time Increment										Storm Duration										Storm CN										Storm T _C										Storm Baseflow																													
T C - 1 5 . 3																																																																																									
T E M P L A T E										Top Width										Z-Upstream										Z-Downstream										Wave Berm Width										Stability Berm Width										DH Maximum																													
W S D A T A										(1)(2)										Runoff Curve Number										Drainage Area in sq. mi.										T _C or W/S Length										— or W/S Δ Elev.										Quick Return Flow-CSM																													
										(1) Areal correction type number, (2) Design class																																																																															
W S P A C C U R																				Delta Y										Delta V																																																											

1/ Output Options:

- L = List Rating Tables
- P = Detailed Inflow and Outflow Hydrograph Plot
- R = Punch Rating Tables
- I = Punch Inflow Hydrograph
- O = Punch Outflow Hydrograph
- C = Detailed List of Coefficients
- E = Calculate Embankment Quantities
- S = Use only Principal Spillway to Route
a Storm Hydrograph

DATE _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
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Key Punch Operator : This Form Set Up For 10—Column Skip.
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WATERSHED _____

TECHNICIAN _____

DATE _____

[illegible]

Page 27

Figure 3

WATERSHED _____

TECHNICIAN _____

DATE _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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DATE _____

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DIMENSIONLESS HYDROGRAPH

WATERSHED _____

TECHNICIAN _____

DATE _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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Control Word																				Peak Factor 'K'										Any Alphameric Label										Card Ident.									
D	I	M	H	Y	D																																												
										Enter successive entries left to right with initial entry for time = 0.																																							
E	N	D		T	A	B	L	E																																									

Key Punch Operator: This Form Set Up For 10-Column Skip.
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UPDATING INPUT DATA

INPUT DATA MAY BE UPDATED FOR MULTIPLE PASSES THROUGH A STRUCTURE OR FOR ROUTING THROUGH MORE THAN ONE STRUCTURE IN A SINGLE COMPUTER RUN. TO UPDATE ANY ITEM OF DATA SIMPLY INSERT THE APPROPRIATE CONTROL CARD CONTAINING THE DESIRED DATA. ALL DATA ITEMS ON THAT CONTROL CARD WILL BE UPDATED, THEREFORE VALUES NOT BEING CHANGED MUST ALSO APPEAR ON THE NEW CARD. FOR EXAMPLE IF A 'PS DATA' CARD READS

PS DATA	1	250	36	0.013	579
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AND THE CONDUIT SIZE IS TO BE CHANGED TO 48 INCHES THE UPDATE CARD WILL READ

PS DATA	1	250	48	0.013	579
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SIMILARLY, TO UPDATE TABULAR DATA, THE ENTIRE TABLE MUST BE INSERTED AGAIN INCLUDING ANY UNCHANGED VALUES. THE PROCESS OF UPDATING IS FURTHER ILLUSTRATED IN THE SAMPLE PROBLEM BELOW.

SAMPLE PROBLEM FOR DAMS2

AN ANALYSIS OF STRUCTURE SITE 15684 OF SAMPLE CREEK WATERSHED IS TO BE PERFORMED. THE DRAINAGE AREA OF THE SITE IS 7.5 SQUARE MILES, ALL UNCONTROLLED. THE RUNOFF CURVE NUMBER FOR ANTECEDANT MOISTURE CONDITION II IS 82, AND THE TIME OF CONCENTRATION IS ESTIMATED TO BE 2.57 HOURS. A NATURAL BASEFLOW OF 20 CFS OR 2.67 CSM EXISTS AT THE SITE WHICH IS TO BE COMPARED WITH THE CHAPTER 21 QUICK RETURN FLOW.

THE ELEVATION-SURFACE AREA RELATIONSHIP OF THE RESERVOIR IS GIVEN IN THE FOLLOWING TABLE. THE AREAS ACCOUNT FOR THE ESTIMATED EFFECT OF THE EMBANKMENT AND BORROW EXCAVATION ON THE RESERVOIR STORAGE.

ELEVATION	SURFACE AREA
FEET	ACRES
576	0.0
578	1.7
580	13.6
582	24.2
584	46.1
586	76.6
588	106.9
590	142.8
592	180.6
596	262.7
600	360.3
604	456.9
608	557.7

THE SITE IS LOCATED IN THE HUMID-SUBHUMID CLIMATE ZONE WHERE AVERAGE ANNUAL PRECIPITATION IS 46 INCHES AND AVERAGE ANNUAL TEMPERATURE IS 59 DEGREES, GIVING A CLIMATIC INDEX OF 1.32 (CHAPTER 21, NEH-4). THE STRUCTURE IS CLASS B (SCS ENGINEERING MEMORANDUM 27) AND THE DESIGN POINT RAINFALL AMOUNTS ARE.....

PRINCIPAL SPILLWAY HYDROGRAPH 1-DAY	5.8 INCHES
PRINCIPAL SPILLWAY HYDROGRAPH 10-DAY	10.2 INCHES
EMERGENCY SPILLWAY HYDROGRAPH	9.1 INCHES
FREEBOARD HYDROGRAPH	14.5 INCHES

THE RESERVOIR IS TO BE MULTI-PURPOSE. THE PERMANENT POOL WILL HAVE 320 ACRE-Feet FOR SEDIMENT ACCUMULATION AND 2280 ACRE-Feet FOR BENEFICIAL USE STORAGE. IN ADDITION, 30 ACRE-Feet OF THE FLOODWATER DETENTION POOL IS ALLOCATED TO SEDIMENT DEPOSITION.

THE ANALYSIS IS TO CONSIDER TWO ALTERNATES FOR THE PRINCIPAL SPILLWAY:

- 1) SINGLE STAGE INLET, 36 INCH R/C PRESSURE PIPE
- 2) TWO-STAGE INLET WITH 2.3 WATERSHED INCHES OF FLOODWATER STORAGE BETWEEN THE LOW AND HIGH STAGES. THE LOW STAGE IS TWO 1 FT X 6 FT SQUARE-EDGED ORIFICES, $C=0.6$. THE CONDUIT IS A MONOLITHIC R/C BOX CULVERT 3 FT X 4 FT WITH 8-INCH FILLETS.

A COVERED INLET WITH INSIDE DIMENSIONS OF 10' X 30' HAVING AN INLET LOSS COEFFICIENT OF 1.0 WILL BE USED FOR THE PIPES. THE BOX WILL USE A SPECIAL-DESIGN 3.5 FT X 10 FT COVERED INLET WITH A WELL-ROUNDED ENTRANCE THAT HAS AN INLET LOSS COEFFICIENT OF 0.5.

THE PRINCIPAL SPILLWAY DISCHARGES INTO THE ATMOSPHERE, SO THE HYDRAULIC GRADE LINE AT THE CONDUIT OUTLET MAY BE TAKEN AS HALF THE HEIGHT OF THE CONDUIT ABOVE THE OUTLET INVERT, ELEVATION 577.5

THE EMERGENCY SPILLWAY CHANNEL CONSISTS OF AN 80 FOOT FLAT SECTION AND A 240 FOOT, 3 PERCENT, SLOPING SECTION FOR A TOTAL INLET CHANNEL LENGTH OF 320 FEET. THE EXIT CHANNEL WILL BE DESIGNED SO THAT A CONTROL SECTION EXISTS OVER AN ADEQUATE RANGE OF DISCHARGES. THE ROUGHNESS COEFFICIENT OF THE APPROACH CHANNEL IS ESTIMATED AS 0.030, THE EXIT CHANNEL 0.035. THE ES CHANNEL WILL HAVE 3 TO 1 SIDE SLOPES ON THE INSIDE, 2 TO 1 ON THE OUTSIDE.

FOR THE TWO-STAGE INLET, THE ES MIGHT BE SHIFTED TO THE OPPOSITE ABUTMENT IN WHICH CASE THE BOTTOM PROFILE OF THE APPROACH CHANNEL WILL CORRESPOND TO CASE 1 OF SCS STANDARD DRAWING ES-124. THE INLET CHANNEL LENGTH IS 185 FEET. ALL OTHER VALUES ARE THE SAME.

EMERGENCY SPILLWAY BOTTOM WIDTHS OF 100 AND 200 FEET ARE TO BE CONSIDERED. THE BOTTOM WIDTH FOR A MAXIMUM VELOCITY OF 7 FEET PER SECOND IN THE EXIT CHANNEL IS ALSO DESIRED.

THE MINIMUM ES CREST ELEVATION IS TO BE DETERMINED AS WELL AS AN ALTERNATE CREST 1 FOOT HIGHER.

THE VOLUME OF EARTH FILL FOR AN EMBANKMENT HAVING A 30 FOOT TOP WIDTH, UPSTREAM AND DOWNSTREAM SIDE SLOPES OF 3 TO 1, AND A 30 FOOT WIDE BERM AT THE PERMANENT POOL ELEVATION IS DESIRED. THE PROFILE ALONG THE CENTERLINE OF THE PROPOSED STRUCTURE FOLLOWS.

	DISTANCE	ELEVATION
	FEET	FEET
1	-1180	620.0
2	-1000	613.0
3	-750	604.0
4	-500	596.5
5	-280	590.0
6	-150	586.0
7	-50	584.0
8	200	583.0
9	600	584.0
10	620	574.0
11	670	576.0
12	690	583.0
13	1110	585.0
14	1360	591.0
15	1600	602.0
16	1870	608.0

SOLUTION FOR SAMPLE PROBLEM

THE ANALYSIS WILL BE MADE IN THREE PASSES, ONE FOR EACH PRINCIPAL SPILLWAY CONFIGURATION AND ONE MORE FOR THE TWO-STAGE-CASE 1 EMERGENCY SPILLWAY COMBINATION. SINCE SEVERAL ALTERNATES ARE BEING CONSIDERED, THE MINIMUM VOLUME OF OUTPUT IS DESIRABLE TO SIMPLIFY DIGESTION OF THE RESULTS. A FOLLOW-UP RUN WILL BE PERFORMED FOR THE SELECTED CONFIGURATION AT WHICH TIME DETAILED OUTPUT WILL BE REQUESTED. AS CODED, THE ELEVATION-SURFACE AREA RELATIONSHIP HAS BEEN TRUNCATED AT ELEVATION 586 AND THE ACCUMULATED VOLUME TO THAT ELEVATION ENTERED IN THE 'STRUCTURE' TABLE.

THE FOLLOWING IS A COMPUTER PRINTOUT OF THE INPUT DATA AND OUTPUT TO ACCOMPLISH THE ABOVE ANALYSIS.

DAMS2 XEQ 02/08/71
REV 01/25/71

***** 80-80 LIST OF INPUT DATA *****

DAMS2	12/15/70	SAMPLE CREEK WATERSHEO, ANYSTATE					010
STRUCTURE	15684	STRUCTURE 15684, AT CGORDS 2,400,400- 456,700					020
		586	76.6	247.8			030
		588	106.9				040
		590	142.8				050
		592	180.6				060
		596	262.7				070
		600	360.3				080
		604	456.9				090
		608	557.7				100
ENDTABLE							110
CLPROFILE		STRUCTURE 15684, AT 2,400,400-456,700					120
	-1180.	620.	-1000.	613.	-750.	604.	130
	-500.	596.5	-280.	590.	-150.	586.	140
	-50.	584.	200.	583.	600.	584.	150
	620.	574.	670.	576.	690.	583.	160
	1110.	585.	1360.	591.	1600.	602.	170
	1870.	608.					180
ENDTABLE							190
WSDATA	28	82	7.5	2.57		2.67	200
PSDATA	1	250	36		0.013	579.0	210
PSINLET		1.0	18				220
POOLDATA	AC-FT	320	2600	30			230
ESCREST	FEET		1.0				240
ESDATA	44	320	0.030	2.5	0.035		250
BTMWIOTH	FEET	100	200				260
BTMWIOTH	VELOCITY	7.0					270
POIRECT	1.32	5.8	10.2	9.1	14.5	11.0	280
ESPROFILE	44	80.	0.	1080.	30.		290
TEMPLATE	30	3	3	30			300
PSCOEFFS					8.0		310
COMMENT	PASS NUMBER 1, USING 36 INCH PIPE, SINGLE STAGE INLET, AND						320
COMMENT	TYPE 44 EMERGENCY SPILLWAY						330
GO,DESIGN E							340
COMMENT	PASS NUMBER 2, USING 3 X 4 BOX CONDUIT, TWO-STAGE INLET, AND						350
*	TYPE 44 EMERGENCY SPILLWAY						360
PSOATA	1	250	3	4	0.013	579.5	370
PSINLET	INCHES	0.5	20	2.3	1.0	12.0	380
GO,DESIGN E							390
*	PASS NUMBER 3, USING 3 X 4 BOX CONDUIT, TWO-STAGE INLET, AND						400
*	TYPE 01 EMERGENCY SPILLWAY						410
ESOATA	01	185	0.030	2.5	0.035		420
GO,DESIGN E							430
*	PASS NUMBER 4, SAME AS PASS NO. 3, EXCEPT ONLY ONE ES CREST						440
*	AND BOTTOM WIDTH IS USED TO SHOW THE DETAILED PRINT OPTIONS.						450
ESCREST							460
BTMWIOTH	FEET	100					470
GO,DESIGN LPCE							480
ENDJOB							490

DAMS2 XEQ 02/08/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE

PASS NUMBER 1, USING 36 INCH PIPE, SINGLE STAGE INLET, AND
TYPE 44 EMERGENCY SPILLWAY

DAMS2 XEQ 02/CR/71
KEV 01/25/71

SAMPLE CREEK WATERSHEO, ANYSTATE
STRUCTURE 15684, AT COOROS 2,400,400- 456,700

PASS 1
PAGE 1

Page 36

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***** BASIC DATA *****
HUMID-SUBHUMID CLIMATE AREA                                DESIGN CLASS  B
STORM DISTRIBUION.....SCS DESIGN STORM RAINFALL DISTRIBUION. (CHAPTER 21, NEH4 AND SCS EM-27)

P-PS1 DAY      P-PS10 DAY      P-ES      P-FB      CN      OA-SM      TC/L      -/H
  5.80          10.20          9.10      14.50      82.00      7.50      2.57      0.0

CONQUITS        CONO L        O/W        -/H        PS N        KI        WEIR L      TW EL
  1.00          250.00        36.00      0.0        0.013       1.00      18.00      579.00

PERM POOL        CREST PS        FP SEO      BASEFLOW    2ND STG      ORF H      ORF L      START
  320.00        2600.00        30.00      2.67        0.0        0.0        0.0        0.0

  ES1           ES2           ES3           ES4           ES5           Z ES        EXIT M      EXIT S
  0.0           1.00          0.0          0.0          0.0          2.50        0.035      0.0

FS TYPE          ES L          ES N          BW1          BW2          BW3          BW4          BW5
  44            320          0.030        100.00       200.00       -7.00        0.0        0.0

PROVIDED BY ES FILE

ES CODE          INCREMENT          Q1          Q2          Q3          Q4
44320.030        1.000              1.864        6.415        12.760        20.598

  Q5           Q6           Q7           Q8           Q9           Q10          Q11          Q12
  29.634       39.759       50.855       62.911       75.794       89.491       103.953      119.112

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PERM PDQL	586.87 FT	320.0 ACFT	89.75 AC
CREST PS	598.43 FT	2600.0 ACFT	321.88 AC
SED ACCUM	598.52 FT	2629.9 ACFT	324.15 AC
BASEFLOW	599.16 FT	2842.1 ACFT	339.74 AC

SCS-PSH	RAINFALL	1 DAY = 5.80 IN	10 DAY = 10.20 IN
	RUNOFF	1 DAY = 3.80 IN	10 DAY = 6.14 IN

CLIMATIC INDEX = 1.32

BASEFLOW = 36.00 CFS

TYPE	EMAX	VMAX	AMAX	QMAX
SCS-PSH	603.23 FT	4426.3 ACFT	438.28 AC	143.0 CFS
PS STORAGE	1796.4 ACFT			

DDT TEST	599.58 FT	2989.2 ACFT	70.4 CFS
CONTROL IS 0.200 DETENTION STORAGE			

DRAWDOWN TIME = 7.88 DAYS (LIMIT = 10.00 DAYS)

DAMS2 XEQ C2/C8/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE
STRUCTURE 15684, AT COORDS 2,400,400- 456,700

PASS 1
PAGE 3

Page 38

ES CREST 603.23 FT 4426.3 ACFT 438.28 AC
PS STORAGE 1756.4 ACFT
STARTING E 598.52 FT 2629.9 ACFT 324.15 AC 3.4 CFS
SCS-ESH O= 6.00 HR P= 9.10 IN Q= 6.91 IN
TC= 2.57 HR CN= 82.00 V= 2735.7 ACFT
PEAK 9612.7 CFS AT 4.04 HRS
SCS-FBH O= 6.00 HR P= 14.50 IN Q= 12.16 IN
TC= 2.57 HR CN= 82.00 V= 4815.3 ACFT
PEAK 17013.4 CFS AT 4.04 HRS

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	100.0	604.84	5165.0	478.1	1.61	739.0	148.	488.	636.	0.89	5.36	0.019	0.025	35.9
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C <td>V/C</td> <td>S/C</td> <td>S/C.25</td> <td>O-ES</td>	V/C	S/C	S/C.25	O-ES
SCS-FBH	100.0	607.72	6646.8	550.7	4.49	2220.8	156.	2685.	2841.	2.70	5.32	0.013	0.017	49.4

VOLUME FILL= 171825. CY, MAX. HEIGHT= 33.7 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2710.9 FT
AREA OF DAM= 9.27 AC, AREA TO SEED= 8.96 AC

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	200.0	604.71	5103.3	474.9	1.48	677.3	147.	828.	975.	0.80	5.09	0.019	0.026	26.3
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C <td>V/C</td> <td>S/C</td> <td>S/C.25</td> <td>O-ES</td>	V/C	S/C	S/C.25	O-ES
SCS-FBH	200.0	607.14	6330.2	536.0	3.91	1904.2	154.	4140.	4294.	2.32	8.55	0.013	0.018	33.8

VOLUME FILL= 164039. CY, MAX. HEIGHT= 33.1 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2668.5 FT
AREA OF DAM= 9.03 AC, AREA TO SEED= 8.71 AC

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	200.0	605.00	5240.4	482.1	1.77	814.4	148.	127.	275.	1.00	5.66	0.018	0.024	57.9
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C <td>V/C</td> <td>S/C</td> <td>S/C.25</td> <td>O-ES</td>	V/C	S/C	S/C.25	O-ES
SCS-FBH	200.0	608.49	7075.2	570.0	5.26	2649.3	158.	882.	1039.	3.14	10.06	0.012	0.017	100.2

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 182353. CY, MAX. HEIGHT= 34.5 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2744.6 FT
AREA OF DAM= 9.58 AC, AREA TO SEED= 9.27 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENDPPOINT - STRUCTURE 15684, AT 2,400,400-456,700

FS CREST 604.23 FT 4876.7 ACFT 462.67 AC
PS STORAGE 2246.8 ACFT
STARTING E 598.52 FT 2629.9 ACFT 324.15 AC 3.4 CFS
SCS-ESH D= 6.00 HR P= 9.10 IN Q= 6.91 IN
TC= 2.57 HR CN= 82.00 V= 2735.7 ACFT
PEAK 9612.7 CFS AT 4.04 HRS
SCS-FBH D= 6.00 HR P= 14.50 IN Q= 12.16 IN
TC= 2.57 HR CN= 82.00 V= 4815.3 ACFT
PEAK 17013.4 CFS AT 4.04 HRS

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	100.0	605.00	5240.8	482.1	0.77	364.5	148.	150.	298.	0.41	3.63	0.024	0.033	24.9
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-FBH	100.0	608.06	6832.3	559.1	3.83	1956.0	157.	2032.	2189.	2.26	8.52	0.014	0.019	49.5

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 176395. CY, MAX. HEIGHT= 34.1 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2722.7 FT
AREA OF DAM= 9.41 AC, AREA TO SEED= 9.10 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENDPOINT - STRUCTURE 156B4, AT 2,400,400-456,700

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	200.0	604.95	5218.2	480.9	0.72	341.9	148.	272.	421.	0.38	3.52	0.025	0.033	19.6
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-FBH	200.0	607.61	6586.2	547.9	3.38	1709.9	155.	3247.	3403.	1.98	7.99	0.014	0.019	34.1

VOLUME FILL= 170332. CY, MAX. HEIGHT= 33.6 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2702.9 FT
AREA OF DAM= 9.22 AC, AREA TO SEED= 8.91 AC

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	20.0	605.05	5264.0	483.3	0.82	387.6	148.	34.	182.	0.43	3.74	0.024	0.032	33.3
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-FBH	20.0	608.63	7156.4	573.5	4.40	2280.0	158.	619.	777.	2.57	9.10	0.013	0.018	97.7
MINIMUM ES	20.0	608.72	7210.4	575.9	4.49	2334.1	158.	640.	798.	2.62	9.19	0.013	0.018	0.0

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 185669. CY, MAX. HEIGHT= 34.7 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2751.2 FT
AREA OF DAM= 9.68 AC, AREA TO SEED= 9.36 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENDPOINT - STRUCTURE 156B4, AT 2,400,400-456,700

DAMS2 XEQ 02/08/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE

PASS NUMBER 2, USING 3 X 4 BOX CONDUIT, TWO-STAGE INLET, AND
TYPE 44 EMERGENCY SPILLWAY

***** BASIC DATA *****

HUMID-SUBHUMID CLIMATE AREA

DESIGN CLASS B

STORM DISTRIBUTION.....SCS DESIGN STORM RAINFALL DISTRIBUTION. (CHAPTER 21, NEH4 AND SCS EM-27)

P-PS1 DAY 5.80	P-PS10 DAY 10.20	P-ES 9.10	P-FB 14.50	CN 82.00	DA-SM 7.50	TC/L 2.57	-/H 0.0
CONUITS 1.00	COND L 250.00	D/W 3.00	-/H 4.00	PS N 0.013	KI 0.50	WEIR L 20.00	TW EL 579.50
PERM POOL 320.00	CREST PS 2600.00	FP SED 30.00	BASEFLOW 2.67	NO STG 2.30	ORF H 1.00	ORF L 12.00	STAPT 0.0
ES1 0.0	ES2 1.00	ES3 0.0	ES4 0.0	ES5 0.0	Z ES 2.50	EXIT N 0.035	EXIT S 0.024
ES TYPE 44	ES L 320	ES N 0.030	BW1 100.00	BW2 200.00	BW3 -7.00	BW4 0.0	BW5 0.0
PROVIDED BY ES FILE							
ES CODE 44320.030	INCREMENT 1.000			Q1 1.864	Q2 6.415	Q3 12.760	Q4 20.598
Q5 29.634	Q6 39.759	Q7 50.855	Q8 62.911	Q9 75.794	Q10 89.491	Q11 103.953	Q12 119.112

DAMS2 XEQ 02/08/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE
STRUCTURE 15684, AT CDDKOS 2,400,400- 456,700

PASS 2
PAGE 2

PEFM POOL	566.87 FT	320.0 ACFT	89.75 AC
CREST PS	598.43 FT	2600.0 ACFT	321.88 AC
SED ACCUM	598.52 FT	2629.9 ACFT	324.15 AC
BASEFLOW	599.40 FT	2923.6 ACFT	345.54 AC
2ND STAGE	601.10 FT	3549.9 ACFT	386.99 AC

SCS-PSH	RAINFALL	1 DAY = 5.80 IN	10 DAY = 10.20 IN
	RUNOFF	1 DAY = 3.80 IN	10 DAY = 6.14 IN

CLIMATIC INDEX = 1.32

BASEFLOW = 36.00 CFS

TYPE	EMAX	VMAX	AMAX	QMAX
SCS-PSH	603.42 FT	4510.1 ACFT	442.87 AC	254.2 CFS
PS STORAGE	1880.2 ACFT			

DOT TEST 599.63 FT 3006.0 ACFT 48.4 CFS
CONTROL IS 0.200 DETENTION STORAGE

DRAWDOWN TIME = 13.67 DAYS (LIMIT = 10.00 DAYS)

ES CREST 603.42 FT 4510.1 ACFT 442.87 AC
PS STORAGE 1880.2 ACFT
STARTING E 599.98 FT 3129.3 ACFT 359.78 AC 58.8 CFS
SCS-ESH D= 6.00 HR P= 9.10 IN Q= 6.91 IN
TC= 2.57 HR CN= 82.00 V= 2735.7 ACFT
PEAK 9612.7 CFS AT 4.04 HRS
SCS-FBH D= 6.00 HR P= 14.50 IN Q= 12.16 IN
TC= 2.57 HR CN= 82.00 V= 4815.3 ACFT
PEAK 17013.4 CFS AT 4.04 HRS

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	100.0	605.58	5524.7	496.7	2.16	1014.6	266.	782.	1047.	1.21	6.25	0.017	0.023	30.3
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	D-ES
SCS-FBH	100.0	608.28	6960.2	564.9	4.86	2450.1	279.	3035.	3315.	2.92	9.69	0.012	0.017	39.8

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 179529. CY, MAX. HEIGHT= 34.3 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2739.0 FT
AREA OF DAM= 9.50 AC, AREA TO SEED= 9.19 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENOPOINT - STRUCTURE 15684, AT 2,400,400-456,700

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	200.0	605.37	5422.2	491.5	1.95	912.1	265.	1320.	1585.	1.10	5.94	0.017	0.024	22.8
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-FBH	200.0	607.62	6592.0	548.2	4.20	2081.9	276.	4666.	4942.	2.51	8.99	0.013	0.018	28.1

VOLUME FILL= 170477. CY, MAX. HEIGHT= 33.6 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2703.7 FT
AREA OF DAM= 9.23 AC, AREA TO SEED= 8.91 AC

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	84.0	605.62	5545.3	497.8	2.20	1035.2	266.	679.	945.	1.24	6.31	0.017	0.023	32.3
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	D-ES
SCS-FBH	84.0	608.42	7039.1	568.4	5.00	2529.0	280.	2697.	2977.	3.00	9.83	0.012	0.017	43.1

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 181463. CY, MAX. HEIGHT= 34.4 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2742.9 FT
AREA OF DAM= 9.56 AC, AREA TO SEED= 9.24 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENOPOINT - STRUCTURE 15684, AT 2,400,400-456,700

DAMS2 XEQ 02/08/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE
STRUCTURE 15684, AT COORDS 2,400,400- 456,700

PASS 2
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ES CREST 604.42 FT 4965.1 ACFT 467.46 AC
PS STORAGE 2335.2 ACFT
STARTING E 599.98 FT 3129.3 ACFT 359.78 AC 58.8 CFS
SCS-ESH D= 6.00 HR P= 9.10 IN Q= 6.91 IN
 TC= 2.57 HR CN= 82.00 V= 2735.7 ACFT
 PEAK 9612.7 CFS AT 4.04 HRS
SCS-FBH D= 6.00 HR P= 14.50 IN Q= 12.16 IN
 TC= 2.57 HR CN= 82.00 V= 4815.3 ACFT
 PEAK 17013.4 CFS AT 4.04 HRS

TYPE	8W	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	100.0	605.79	5628.5	501.9	1.37	663.5	267.	360.	627.	0.73	4.85	0.020	0.027	25.0
TYPE	8W	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	O-ES
SCS-FBH	100.0	608.64	7162.2	573.8	4.22	2197.1	281.	2343.	2624.	2.47	8.92	0.013	0.018	39.7

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 184484. CY, MAX. HEIGHT= 34.6 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2748.9 FT
AREA OF DAM= 9.64 AC, AREA TO SEED= 9.33 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENDPOINT - STRUCTURE 15684, AT 2,400,400-456,700

TYPE	8W	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	200.0	605.69	5581.6	499.6	1.28	616.6	266.	626.	893.	0.67	4.64	0.020	0.028	19.9
TYPE	8W	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-FBH	200.0	608.12	6866.0	560.6	3.70	1901.0	279.	3735.	4014.	2.17	8.36	0.014	0.019	28.2

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 177222. CY, MAX. HEIGHT= 34.1 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2734.4 FT
AREA OF DAM= 9.44 AC, AREA TO SEED= 9.12 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENDPOINT - STRUCTURE 15684, AT 2,400,400-456,700

TYPE	8W	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	20.0	605.89	5681.0	504.6	1.47	715.9	267.	89.	356.	0.80	5.07	0.019	0.026	34.1
TYPE	8W	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	D/C	V/C	S/C	S/C.25	O-ES
SCS-FBH	20.0	609.30	7547.6	590.5	4.88	2582.6	284.	714.	998.	2.79	9.48	0.013	0.017	72.8

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 193952. CY, MAX. HEIGHT= 35.3 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2767.3 FT
AREA OF DAM= 9.91 AC, AREA TO SEED= 9.59 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENDPOINT - STRUCTURE 15684, AT 2,400,400-456,700

DAMS2 XEQ 02/08/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE

PASS NUMBER 3, USING 3 X 4 BOX CONDUIT, TWO-STAGE INLET, AND
TYPE 01 EMERGENCY SPILLWAY

DAMS2 XEQ 02/08/71
REV C1/25/71

SAMPLE CREEK WATERSHED, ANYSTATE
STRUCTURE 15684, AT COORDS 2,400,400- 456,700

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***** BASIC DATA *****
HUMID-SUBHUMID CLIMATE AREA                                DESIGN CLASS B
STORM DISTRIBUTION.....SCS DESIGN STORM RAINFALL DISTRIBUTION. (CHAPTER 21, NEH4 AND SCS EM-27)

P-PS1 DAY      P-PS10 DAY      P-F5      P-F8      CN      OA-SM      TC/L      -/H
5.8C           10.20           9.10      14.50      82.00      7.50      2.57      0.0

CONDUITS       CONO L      O/W      -/H      PS N      KI      WEIR L      TW EL
1.00           250.00      3.00      4.00      0.013     0.50      20.00      579.50

PERM POOL      CREST PS      FP SED      BASEFLOW      ZNO STG      ORF H      ORF L      STAPT
320.00         2600.00      30.00      2.67      2.30      1.00      12.00      0.0

ES1            ES2            ES3            ES4            ES5            Z ES      EXIT N      EXIT S
0.0            1.00          0.0          0.0          0.0          2.50      0.035      0.0

ES TYPE        ES L      ES N      BW1      BW2      BW3      BW4      BW5
1             185      0.030     100.00     200.00     -7.00      0.0      0.0

PROVIDED BY ES FILE

ES CODE      INCREMENT      Q1      Q2      Q3      Q4
1185.030     1.000          1.468     5.540     11.545     19.130

Q5           Q6           Q7           Q8           Q9           Q10          Q11          Q12
28.016       38.074       49.122       61.188       74.087       87.809       102.298      117.526

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PERM POOL	586.87 FT	320.0 ACFT	89.75 AC
CREST PS	598.43 FT	2600.0 ACFT	321.88 AC
SED ACCUM	598.52 FT	2629.9 ACFT	324.15 AC
BASEFLOW	599.40 FT	2923.6 ACFT	345.54 AC
2ND STAGE	601.10 FT	3549.9 ACFT	386.99 AC

SCS-PSH	RAINFALL	1 DAY =	5.80 IN	10 DAY =	10.20 IN
	RUNOFF	1 DAY =	3.80 IN	10 DAY =	6.14 IN

CLIMATIC INDEX = 1.32

BASEFLOW = 36.00 CFS

TYPE	EMAX	VMAX	AMAX	QMAX
SCS-PSH	603.42 FT	4510.1 ACFT	442.87 AC	254.2 CFS
PS STORAGE	1880.2 ACFT			

DDT TEST	599.63 FT	3006.0 ACFT	48.4 CFS
CONTROL IS 0.200 DETENTION STORAGE			

DRAWDOWN TIME = 13.67 DAYS (LIMIT = 10.00 DAYS)

OAMS2 XEQ 02/C8/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE
STRUCTURE 15684, AT COOROS 2,400,400- 456,700

PASS 3
PAGE 3

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ES CREST 603.42 FT 4510.1 ACFT 442.87 AC
PS STORAGE 1880.2 ACFT
STARTING E 559.98 FT 3129.3 ACFT 359.78 AC 58.8 CFS
SCS-ESH O= 6.00 HR P= 9.10 IN Q= 6.91 IN
TC= 2.57 HR CN= 82.00 V= 2735.7 ACFT
PEAK 9612.7 CFS AT 4.04 HRS
SCS-FBH O= 6.00 HR P= 14.50 IN Q= 12.16 IN
TC= 2.57 HR CN= 82.00 V= 4815.3 ACFT
PEAK 17013.4 CFS AT 4.04 HRS

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	100.0	605.62	5542.5	497.6	2.20	1032.4	266.	703.	969.	1.13	6.04	0.017	0.023	32.4
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	O-ES
SCS-FBH	100.0	608.35	6996.0	566.5	4.93	2485.9	280.	2914.	3194.	2.84	9.57	0.013	0.017	42.4

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 180407. CY, MAX. HEIGHT= 34.3 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2740.8 FT
AREA OF OAM= 9.53 AC, AREA TO SEE= 9.21 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENOPOINT - STRUCTURE 15684, AT 2,400,400-456,700

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	200.0	605.42	5447.8	492.8	2.01	937.7	265.	1202.	1467.	1.03	5.76	0.018	0.024	24.8
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	O-ES
SCS-FBH	200.0	607.71	6639.2	550.4	4.29	2129.1	277.	4505.	4782.	2.46	8.89	0.013	0.018	30.5

VOLUME FILL= 171636. CY, MAX. HEIGHT= 33.7 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2709.9 FT
AREA OF OAM= 9.27 AC, AREA TO SEE= 8.95 AC

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	O-ES
SCS-ESH	20.0	605.84	5653.9	503.2	2.42	1143.8	267.	189.	456.	1.27	6.40	0.016	0.022	46.6
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TOT	O/C	V/C	S/C	S/C.25	O-ES
SCS-FBH	20.0	609.18	7475.1	587.4	5.76	2965.0	284.	948.	1232.	3.28	10.27	0.012	0.016	78.2

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 192171. CY, MAX. HEIGHT= 35.2 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2763.8 FT
AREA OF OAM= 9.86 AC, AREA TO SEE= 9.54 AC

*****WARNING.....TOP OF OAM EXCEEDS CLPROFILE ENDPOINT - STRUCTURE 15684, AT 2,400,400-456,700

ES CREST 604.42 FT 4965.1 ACFT 467.46 AC
PS STORAGE 2335.2 ACFT
STARTING E 599.98 FT 3129.3 ACFT 359.78 AC 58.8 CFS
SCS-ESH D= 6.00 HR P= 9.10 IN Q= 6.91 IN
TC= 2.57 HR CN= 82.00 V= 2735.7 ACFT
PEAK 9612.7 CFS AT 4.04 HRS
SCS-F8H O= 6.00 HR P= 14.50 IN Q= 12.16 IN
TC= 2.57 HR CN= 82.00 V= 4815.3 ACFT
PEAK 17013.4 CFS AT 4.04 HRS

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TDT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	100.0	605.81	5638.6	502.5	1.39	673.5	267.	309.	576.	0.66	4.61	0.020	0.028	26.6
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TDT	D/C	V/C	S/C	S/C.25	D-ES
SCS-F8H	100.0	608.70	7195.1	575.2	4.28	2230.1	281.	2218.	2500.	2.39	8.77	0.013	0.018	42.4

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 185293. CY, MAX. HEIGHT= 34.7 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2750.5 FT
AREA OF DAM= 9.67 AC, AREA TO SEED= 9.35 AC

*****WARNING.....TDP OF DAM EXCEEDS CLPRDFILE ENDPDINT - STRUCTURE 15684, AT 2,400,400-456,700

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TDT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	200.0	605.73	5597.3	500.4	1.31	632.3	267.	546.	812.	0.61	4.44	0.021	0.029	21.6
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TDT	D/C	V/C	S/C	S/C.25	D-ES
SCS-F8H	200.0	608.20	6910.6	562.6	3.78	1945.6	279.	3563.	3842.	2.11	8.23	0.014	0.019	30.8

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 178315. CY, MAX. HEIGHT= 34.2 FT
TDP WIDTH= 30.0 FT, TOP LENGTH= 2736.6 FT
AREA OF DAM= 9.47 AC, AREA TO SEED= 9.15 AC

*****WARNING.....TDP OF DAM EXCEEDS CLPRDFILE ENDPDINT - STRUCTURE 15684, AT 2,400,400-456,700

TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TDT	D/C	V/C	S/C	S/C.25	D-ES
SCS-ESH	20.0	605.90	5684.1	504.7	1.48	719.0	267.	75.	342.	0.71	4.80	0.020	0.027	34.8
TYPE	BW	EMAX	VMAX	AMAX	HP	V-ES	Q-PS	Q-ES	Q-TDT	D/C	V/C	S/C	S/C.25	D-ES
SCS-F8H	20.0	609.33	7561.8	591.1	4.91	2596.8	284.	665.	949.	2.68	9.29	0.013	0.017	75.7

*****WARNING.....THIS SOLUTION EXCEEDED MAXIMUM INPUT ELEVATION (608.00)

VOLUME FILL= 194303. CY, MAX. HEIGHT= 35.3 FT
TOP WIDTH= 30.0 FT, TOP LENGTH= 2767.9 FT
AREA OF DAM= 9.92 AC, AREA TO SEED= 9.60 AC

*****WARNING.....TOP OF DAM EXCEEDS CLPRDFILE ENDPDINT - STRUCTURE 15684, AT 2,400,400-456,700

DAMS2 XEQ C2/08/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE

PASS NUMBER 4, SAME AS PASS NO. 3, EXCEPT ONLY ONE ES CREST
AND BOTTOM WIDTH IS USED TO SHOW THE DETAILED PRINT OPTIONS.

***** BASIC DATA *****

HUMID-SUBHUMID CLIMATE AREA

DESIGN CLASS B

STORM DISTRIBUTION.....SCS DESIGN STORM RAINFALL DISTRIBUTION. (CHAPTER 21, NEH4 AND SCS EM-27)

P-PS1 DAY 5.80	P-PS10 DAY 10.20	P-ES 9.10	P-FB 14.50	CN 92.00	OA-SM 7.50	TC/L 2.57	-/H 0.0
CONOUIITS 1.00	COND L 250.00	D/W 3.00	-/H 4.00	PS N 0.013	KI 0.50	WEIR L 20.00	TW EL 579.50
PERM POOL 220.00	CREST PS 2600.00	FP SEO 30.00	BASEFLOW 2.67	2ND STG 2.30	ORF H 1.00	ORF L 12.00	START 0.0
ES1 0.0	ES2 0.0	ES3 0.0	ES4 0.0	ES5 0.0	Z ES 2.50	EXIT N 0.035	EXIT S 0.022
FS TYPE 1	ES L 185	ES N 0.030	8W1 100.00	8W2 0.0	8W3 0.0	8W4 0.0	8W5 0.0

PROVIDED BY ES FILE

ES CODE 1185.030	INCPEMENT 1.000		Q1 1.468	Q2 5.540	Q3 11.545	Q4 19.130
Q5 28.016	Q6 38.074	Q7 49.122	Q8 61.188	Q9 74.087	Q10 87.809	Q11 102.298
					Q12 117.526	

***** DETAILED LIST OF BASIC DATA *****

WEIR COEF. FOR ORIFICES..... 3.10	RATIO OF IA TO S(CH.10,NEH4).. 0.20	MIN ES 8W WHEN MAX V/C GIVEN.. 20.0
WEIR COEF. FOR DROP INLET..... 3.10	TIME INCS TO PEAK OF UNIT HYD. 5.	DELTA 8W WHEN MAX V/C GIVEN... 64.0
DISCHARGE COEF. FOR ORIFICES.. 0.60	NO. POINTS FOR DESIGN HYD..... 101	PRECISION OF 8W SOLUTION..... 1.0
FILLET SIZE FOR 80X CONOUIITS.. 8.00	ES-WSP CALC. DEPTH PRECISION. 0.005	PRECISION OF V/C SOLUTION..... 0.03
GRAVITATIONAL CONSTANT..... 32.16	ES-WSP PERMISSIBLE VEL.CHANGE. 0.05	

EMBANKMENT TEMPLATE	TOP WIDTH 30.0	UPSTREAM Z 3.0	DOWNSTREAM Z 3.0	WAVE BERM 30.0	STAB. BERM 0.0	OH MAX 0.0
RAINFALL EQUATION CONSTANTS CLASS B	K1 PSB 0.91	K1 ESH 1.00	K1 FBH 1.00	K2 PSB 0.0	K2 ESH 0.12	K2 FBH 0.40

DIMENSIONLESS UNIT HYDROGRAPH

PEAK FACTOR = 484.0

0.0	0.030	0.100	0.190	0.310	0.470	0.660	0.820	0.930	0.990
1.000	0.990	0.930	0.860	0.780	0.680	0.560	0.460	0.390	0.330
0.280	0.240	0.207	0.177	0.147	0.127	0.107	0.090	0.077	0.065
0.055	0.047	0.040	0.034	0.029	0.025	0.021	0.018	0.015	0.013
0.011	0.009	0.008	0.007	0.006	0.005	0.004	0.003	0.002	0.001
0.0									

SCS DESIGN STORM RAINFALL DISTRIBUTION. (CHAPTER 21, NEH4 AND SCS EM-27)

0.0	0.013	0.027	0.042	0.059	0.078	0.099	0.122	0.147	0.180
0.230	0.380	0.530	0.625	0.670	0.705	0.736	0.764	0.790	0.814
0.836	0.856	0.875	0.893	0.910	0.927	0.942	0.957	0.972	0.986
1.000									

IO NAME IS

0.0

OAMS2 XEQ 02/08/71
REV 01/25/71

SAMPLE CREEK WATERSHED, ANYSTATE
STRUCTURE 156B4, AT COOROS 2,400,400- 456,700

PASS 4
PAGE 2

PERM PDDL	586.87 FT	320.0 ACFT	89.75 AC
CREST PS	598.43 FT	2600.0 ACFT	321.88 AC
SEO ACCUM	598.52 FT	2629.9 ACFT	324.15 AC
BASEFLOW	599.40 FT	2923.6 ACFT	345.54 AC
2NO STAGE	601.10 FT	3549.9 ACFT	386.99 AC

SCS-PSH	RAINFALL	1 OAY =	5.80 IN	10 OAY =	10.20 IN
	RUNOFF	1 OAY =	3.80 IN	10 OAY =	6.14 IN

CLIMATIC INOEK = 1.32

BASEFLOW = 36.00 CFS

TYPE	EMAX	VMAX	QMAX	QMAX
SCS-PSH	603.42 FT	4510.1 ACFT	442.87 AC	254.2 CFS
PS STORAGE	1880.2 ACFT			

OOT TEST 599.63 FT 3006.0 ACFT 48.4 CFS
CONTROL IS 0.200 DETENTION STORAGE

DRAWDOWN TIME = 13.67 DAYS (LIMIT = 10.00 DAYS)

RATING TABLE NUMBER 1

	E	Q	V	A
	FEET	CFS	AC FT	ACRE
1	598.43	0.0	2599.96	321.88
2	598.82	9.13	2728.05	331.45
3	599.21	25.83	2859.88	341.02
4	599.60	47.46	2995.46	350.58
5	600.10	62.65	3174.16	362.78
6	600.60	74.80	3358.93	374.88
7	601.10	85.24	3549.77	386.98
8	601.67	122.05	3772.64	400.65
9	602.24	179.70	4003.24	414.31
10	602.80	250.82	4241.57	427.98
11	604.53	260.50	5019.39	470.38
12	606.27	269.36	5872.11	514.04
13	608.00	277.94	6800.45	557.69

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35000. VELOCITY EXIT

*****WARNING.....TOP OF DAM EXCEEDS CLPROFILE ENDPPOINT - STRUCTURE 15684, AT 2,400,400-456,700

DAMS2.....JOB NO. 1 COMPLETE

SAMPLE CREEK WATERSHED, ANYSTATE

1 STRUCTURE(S) ANALYZED

42 HYDROGRAPHS ROUTED

7 TRIAL ROUTINGS
